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THE NUCLEAR NON-PROLIFERATION REGIME AT THE CROSSROADS :

STRENGTHENING OR UNCERTAINTY

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by

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ABSTRACT

Based on the assumption that further proliferation of nuclear weapons will jeopardize international peace and stability, the ways and means for restraining proliferation of nuclear weapons are extensively researched. The research is conducted at state level.

The framework of international efforts for stopping the spread of nuclear weapons is identified as the ***nuclear non-proliferation regime.*** In that respect, the International Regimes Theory is exploited to a certain extent. The basic premises of the regimes theory furnished the necessary insights about the concepts of international regime formation, regime maintenance, and regime effectiveness. Hence, these concepts have then formed the background of the proposals for increasing the strength of the non-proliferation regime.

The degree of effectiveness of the nuclear non-proliferation regime in inhibiting states from going nuclear is observed to have largely depended on the attitudes of the states that participated in the international negotiations which aimed at establishing the fundamental stones of the regime (e.g., the IAEA Statute, the NPT and the related IAEA safeguards document INFCIRC/153). Emergence and evolution of these elements of the non-proliferation regime are investigated, and the loopholes and shortcomings that came into view in practice are determined.

Despite the fact that an overwhelming majority of states have joined the ranks of international collaboration for halting the further spread of nuclear weapons, a group of states (hold-outs) have opted to stay far from the nuclear non-proliferation regime by putting forward numerous arguments, and went on to manufacture nuclear explosives. Likelihood of an increase in the number of such states in the short and medium terms (unless appropriate measures are taken to strengthen the regime) necessitated a research about various regional and bilateral nuclear restraint arrangements that would prove feasible for associating the hold-outs with the principles, norms, rules, as well as the decision-making procedures of the non-proliferation regime.

Regarding the recent developments in world affairs, measures are suggested to amplify the usefulness and the effectiveness of the essential elements of the nuclear non-proliferation regime. Moreover, measures with regard to several other issues that are not generally considered among these mainstays of the non-proliferation regime, but which are believed by the author to have an impact on the future performance of the regime, are also incorporated into the research.

ÖZET

Nükleer silahların yayılmasının uluslararası barışı ve istikrarı tehdit ettiği yargısından hareketle, yayılmanın önlenmesi konusunda neler yapılması gerektiği hakkında önerilerde bulunmak amacıyla kapsamlı bir araştırma yürütülmüştür. Araştırma ülkeler düzeyinde ele alınmıştır.

Nükleer yayılmaya karşı alınması gereken önlemler çerçevesinde oluşan uluslararası çabalar bütünü ***nükleer silahların yayılmasının önlenmesi rejimi*** olarak tanımlanmaktadır. Bu sebeple, araştırma sırasında yol gösterici olarak Uluslararası Rejimler Teorisi'nin önermelerinden faydalanılmıştır. Böylece, bir uluslararası rejimin oluşması, sürdürülmesi, ve etkin bir yapıya kavuşturulması için neler yapılması gerektiği konularında en sağlam öngörüşlerin oluşturulması amaç edinilmiştir.

Yayılmanın önlenmesine yönelik çabaların etkinliği ülkelerin tutumlarına bağlı olarak sınırlı bir gelişme kaydetmiştir. Bu gerçek karşında, öncelikle söz konusu tutumların sebepleri anlaşılmaya çalışılmış ve yayılmanın önlenmesi rejiminin izlediği gelişme çizgisi ortaya konulmuştur. Aynı zamanda, uluslararası anlaşmalar ve düzenlemelerde şikayet konusu olan ve rejimin daha etkin bir konuma getirilebilmesi için doldurulması gereken hukuki boşlukların ve yetersizliklerin neler olduğunun tespitine çalışılmıştır.

Uluslararası camianın büyük bir çoğunlukla benimsediği ve katıldığı yayılmanın önlenmesi rejimine rağmen, bir kısım ülke çeşitli sebepler öne sürerek bu kapsamda bir gayret içinde olmadıkları gibi, aksine bir davranışla nükleer silah üretme yoluna gitmişlerdir. Dolayısıyla, nükleer yayılmanın önlenmesi rejimi kısa ve orta vadede daha etkin bir yapıya kavuşturulmadığı takdirde sayılarının çok daha fazla olacağından endişe edilen bu gibi ülkelerin, yayılmanın önlenmesi prensibi dahilinde politikalar benimsemelerini sağlayabilmek amacıyla bu yönde örnek teşkil edebilecek değişik uluslararası düzenlemeler tanıtılmıştır.

Esas olarak, yakın geçmişte ve günümüzde dünyada meydana gelen olaylar da dikkate alındığında, yayılmanın önlenmesi rejimi çerçevesindeki uluslararası anlaşmaların ve kurumsal yapıların işlerliklerinin ve etkinliklerinin arttırılması için nelerin yapılması gerektiği yönünde öneriler ortaya konulmuştur. Ayrıca, genellikle yayılmanın önlenmesi rejimi dahilinde tanımlanmayan, ancak tez araştırmacısı tarafından rejimin geleceği üzerinde etkili olacağı düşünülen konular da tez çalışması kapsamına alınmıştır. Böylece, nükleer yayılmanın önlenmesi rejimi dahilinde veya haricinde olan ülkelerin, rejimin prensipleri, normları ve kuralları bağlamında hareket etmelerinin kesin olarak sağlanabilmesi için ne gibi önlemler alınması gerektiği hakkında görüşler belirtilmiştir.

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ABBREVIATIONS

ABACC	Argentine Brazilian Agency for Accounting and Control of Nuclear Materials
AEA	Atomic Energy Act (United States)
AFCONE	African Commission on Nuclear Energy
ASEAN	Association of South East Asian Nations
CD	Conference on Disarmament
CFE	Conventional Forces Europe
CIA	Central Intelligence Agency
COMINT	Communication Intelligence
CSCE	Conference on Security and Co-operation in Europe
CTBT	Comprehensive Test Ban Treaty
CWC	Chemical Weapons Convention
ECSC	European Coal and Steel Community
EEC	European Economic Community
ENDC	Eight-Nation Disarmament Commission
ENEA	European Nuclear Energy Agency
EURATOM	European Atomic Energy Community
FRG	Federal Republic of Germany
GC	General Conference (IAEA)
GPS	Global Positioning Satellite
HEU	Highly Enriched Uranium
HUMINT	Human Intelligence
HWR	Heavy Water Reactor
IADA	International Atomic Development Authority
IAEA	International Atomic Energy Agency

IMINT	Imagery Intelligence
INFCIRC	Information Circular
IOZP	Indian Ocean Zone of Peace
LWR	Light Water Reactor
MBA	Material Balance Area
MLF	Multi-Lateral Force
MUF	Material Unaccounted For
MW	Mega Watt
NATO	North Atlantic Treaty Organization
NNWS	Non-Nuclear-Weapons State
NPT	Nuclear Non-Proliferation Treaty
NSG	Nuclear Suppliers Group
NUCINT	Nuclear Intelligence
NWFZ	Nuclear-Weapons-Free Zone
NWS	Nuclear-Weapons State
OAU	Organization of African Unity
OECD	Organization for Economic Cooperation and Development
OPANAL	Agency for the Prohibition of Nuclear Weapons in Latin America
PNE	Peaceful Nuclear Explosions
PPNN	Programme for Promoting Nuclear Non-Proliferation
PTBT	Partial Test Ban Treaty
SAGSI	Standing Advisory Group on Safeguards Implementation
SCCC	Common System of Accounting and Control of Nuclear Material
SIR	Safeguards Implementation Report
SSAC	State System of Accounting and Control of Nuclear Material
UN	United Nations
UNAEC	United Nations Atomic Energy Commission
UNGA	United Nations General Assembly

UNIDIR	United Nations Institute for Disarmament Research
UNSC	United Nations Security Council
UNSCOM	United Nations Special Commission
USAEC	United States Atomic Energy Commission
ZP	Zone of Peace
ZPCAS	Zone of Peace and Co-operation in the South Atlantic

INTRODUCTION

The events that followed the Iraqi invasion of Kuwait and the disintegration of the Soviet Union revealed that the bipolar international system was eroding and that a new era characterized with uncertainty was emerging. In the midst of the last decade prior to the third millennium, uncertainty still reigns. Scholars and policy makers are therefore very much concerned with what would most likely happen in the future in their fields of interest. Various issue areas are extensively researched with a new momentum, especially since the early 1990s, in the field of the spread of all kinds of weapons of mass destruction. Towards the turn of the millennium, those who have thought that the end of the Cold War would also mean the end of serious confrontations in the international system have been terrified with the rise of the threat of weapons of mass destruction throughout the world. Radical regimes either have already acquired nuclear, chemical, and biological weapons, or are likely to acquire them in the foreseeable future. Therefore, nuclear weapons, the most destructive and lethal among the existing weapons of mass destruction, constitute the focal point of this study with a view to search for the possibilities to halt and even to roll back their proliferation.

The phrase "nuclear proliferation" should indeed imply two kinds of proliferation. One is the so called *vertical proliferation* which means an increase in the number of the nuclear weapons in the military arsenals of the USA, the Russian Federation (inherited from the former Soviet Union), the United Kingdom, France, and the People's Republic of China. The other is *horizontal proliferation,* which means an increase in the number of states that possess nuclear weapons, beyond the five states noted above. This study is more concerned with the dangers of horizontal proliferation. The underlying assumption in this study is that the proliferation of nuclear weapons, *inter alia,* is a serious threat to international peace and stability, hence it should be overcome. There is, however, an ongoing debate among scholars and policy makers on the likely consequences of both the vertical and especially the horizontal proliferation of nuclear weapons for international peace and stability. Views expressed in this debate range from the demands for immediate dismantlement of the existing nuclear weapons to demands for providing complete freedom to states in their exploitation of nuclear energy. For instance, several scholarly writings argue, notwithstanding the basic assumption of this study, that further horizontal proliferation would contribute more to the maintenance of international peace and stability. In order to clarify the basic assumption of this study, this highly stimulating theoretical debate is introduced in Chapter I, to the extent that the of the study permits.

International attempts for halting the proliferation of nuclear weapons in both senses (i.e., vertical and horizontal) have their roots in the initiative of the United Nations General Assembly which created with a resolution the Atomic Energy Commission (UNAEC) in 1946, a very short while later than nuclear weapons were used for the first and the last time in wartime conditions.[1] The mandate of the UNAEC was to search for the possible peaceful uses of nuclear energy and to suggest ways to control the development of nuclear energy so as to prevent its diversion from civilian to military purposes. This short lived attempt was followed by the personal initiative of the then US President Eisenhower who proposed to establish an international authority in the field of atomic energy in his famous speech at the United Nations in 8 December 1953 for the purpose of promoting its world wide peaceful exploitation. The outcome of the follow-up negotiations in various international gatherings was the establishment of the International Atomic Energy Agency (IAEA) in 1957 with its headquarters in Vienna, Austria. The treaty creating

[1] In fact, the first nuclear explosive device was detonated in 16 July 1945 at Alamogordo Desert, Los Alamos, New Mexico, in the United States. This event is also known as the 'Trinity' test. The device had an explosive power of 21 kiloton or an energy equivalent to about 21 tons of TNT.

the IAEA, however, did not contain any promise by the states to refrain from acquiring nuclear weapons, or from conducting nuclear activities outside Agency channels free of safeguards. Hence, to fill in the loopholes in the IAEA Statute, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) was painstakingly drafted in the 1960s by a group of countries led by the United States and the Soviet Union. The NPT was then opened to signature in 1968 and entered into force in 1970. The principal purpose of the NPT was to prevent diversion of nuclear energy from civilian to military purposes by the states that hitherto did not possess nuclear weapons. Accordingly, the NPT aimed at gaining widespread acceptance of the safeguards of the IAEA for controlling as well as promoting peaceful development of nuclear energy all over the world. The drafters of the NPT, however, differentiated among the states party to the Treaty. The states that had detonated a nuclear explosive device prior to 1 January 1967 were recognized in the Treaty as *nuclear-weapon states.*[2] And, the rest of the states were identified as *non-nuclear-weapon states*. Withstanding this differentiation, the nuclear-weapon states that became party to the Treaty solemnly undertook with Article I of the NPT "... *not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices ... and not in any way to assist, encourage or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons* ..." Consequently, with Article II of the Treaty, each non-nuclear-weapon state party to the Treaty undertook "... *not to receive the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices ... not to manufacture or otherwise acquire nuclear weapons ... and not to seek or receive any assistance in the manufacture of nuclear weapons* ..." These phrases incarnated the basic principles and norms as well as the rules that would be eventually adapted by a great majority of states.[3]

[2]The United States was the first state that detonated a nuclear explosive device in 1945. The Soviet Union followed suit in 1949, the United Kingdom in 1952, France in 1960 and the People's Republic of China in 1964. These five states which are also the permanent members of the United Nations Security Council are counted as *de jure* nuclear-weapon states.
[3]So far, more than 170 countries have adhered to the NPT.

States that adhered to the NPT are obliged to comply with its terms fully. And, the task of the *verification* of compliance of non-nuclear-weapon states with their basic undertaking defined as *not to divert nuclear energy from civilian to military purposes* is conferred to the IAEA. Unlike the loose safeguards requirements of the IAEA's preliminary documents[4] the Agency was then granted, with Article III of the NPT, necessary authority to carry out comprehensive (full-scope) safeguards inspections. These inspections were sought to encompass every installation of states party to the Treaty that contained nuclear material. In theory, everything seemed to work well. Because, the IAEA was settled as an organization technically and scientifically competent enough to accomplish its basic task. And, since the states party to the NPT were supposed to submit *all* of their nuclear materials to international controls, then the Agency would certainly determine whether any diversion in the status of the nuclear material happened to take place or not. Hence, world wide peaceful development of nuclear energy could be ascertained.

Nevertheless, theory did not fit *praxis*. Because, according to the terms of the bilateral safeguards agreements concluded between the IAEA and the non-nuclear-weapon states party to the NPT, these states are required to declare to the IAEA the exact locations of their nuclear installations and the initial inventory of nuclear material contained within. Then, the IAEA is authorized to schedule and implement safeguards inspections by relying *only* on the information supplied by the states.[5] This clearly means that the IAEA can be deceived by a state determined to manufacture nuclear weapons clandestinely, simply by not supplying the Agency

[4]Prior to the IAEA safeguards document drafted in 1971 in connection with the requirements of the NPT (INFCIRC/153), the Agency was granted a limited authority to carry out inspections in states' nuclear facilities only in the following cases: (1) if a state received assistance from the IAEA (either nuclear material or technological aid); (2) if a state that provided assistance, instead of the IAEA, to a receiver state made its assistance conditional on IAEA's safeguards inspections; (3) if a state voluntarily asked for IAEA inspections in its installations. In all these cases inspections had to be confined to assistance provided to the states. These inspections were not comprehensive.

[5]During the inspections the IAEA inspectors apply simple material accountancy techniques to the nuclear material to determine whether any significant amount of nuclear material is missing, or not. Inspections are conducted in restricted areas within the facilities called material balance areas.

with accurate information. The liability of the IAEA to rely on the declaration of states is therefore one major deficiency of the safeguards agreements. Only in rare instances the Board of Governors of the IAEA may call a state for conducting special inspections which are however normally limited to the declared sites.[6] A second difficulty in the same regard is that, even if a state accurately accommodates an initial declaration to the IAEA, it may create *frictions* for obstructing timely and effective implementation of safeguards inspections.[7] The principle of sovereignty and the sensitivity of the states to their domestic jurisdiction gave way to such defects in the above noted internationally agreed documents.

Another indication of discrepancy between the theory and *praxis* is the emergence of the *de facto* nuclear-weapons states such as Israel, India, and Pakistan, all of which rejected the NPT membership by putting forward different arguments.[8] Similarly, it has recently been made public that until 1992 South Africa was indeed among this group of states.[9] In the same vein, states like Argentina, Brazil, Algeria, and North Korea have all opted to stay clear from the NPT. The nuclear programmes of this group of states were not as significant as those of the states noted above, but they were still considered as *threshold* states. Consequently, the

[6]According to its Statute and the terms of the safeguards agreement applicable to the states party to the NPT, the IAEA has no power to have access to the suspected sites in a state without the *consent* of the host state. Direct *enforcement* measures are beyond the mandate of the IAEA.

[7]Either by objecting to the inspectors' nationalities or by not providing reliable escort services, and the like, states may seriously delay inspections, and the time gained may be significant from the military point of view. Based on the degree of suspicion, the IAEA may ask more frequent inspection from several states. But, the frequency of inspections is negotiated between the parties, hence no unilateral encroachment is possible. In a protracted conflict, however, the IAEA is not totally powerless. Indicating such a circumstance, through its Board of Governors, ultimately to the UN Security Council, the IAEA may then take several measures for the fulfilment of its task, as it was the case in North Korea.

[8]Although none of these states formally acknowledged the existence of nuclear weapons in their arsenals in varying quantities and payloads, in the nuclear (non-)proliferation literature there exist a plethora of articles and reports that make it certain for the international community to believe in the existence of these weapons in the states mentioned.

[9]The South African President Frederick De Klerk had declared in March 1993 prior to leaving the office to his successor Nelson Mandela, leader of the black majority, that they manufactured six nuclear weapons in South Africa and the seventh was underway, but they dismantled all of the weapons together with their test sites and that they converted their nuclear installations for civilian goods manufacturing. Then, South Africa adhered to the NPT as a non-nuclear-weapon state.

basic principles and norms which were brought into practice by the terms of the NPT could not be made applicable to this category of states.

Ever since the very presence of nuclear weapons on earth, those who believed in the necessity and urgency of the struggle against the danger of nuclear proliferation have developed different non-proliferation instruments such as the nuclear-weapons-free zones or zones of peace, and bilateral/multilateral nuclear restraint agreements. These instruments have become effective, to some extent, in widening the scope of the efforts to stop the spread of nuclear weapons, and nuclear material and technology used in the manufacture of such weapons. These efforts have eventually culminated in what is called the *nuclear non-proliferation regime*. The IAEA Statute and its safeguards together with the Nuclear Non-Proliferation Treaty are regarded as the "backbone" of the non-proliferation regime. Apart from these, several other institutions such as EURATOM[10], and the Treaty of Tlatelolco[11] had already been established prior to the NPT. Some other important elements of the regime are also established as reactions to the post NPT developments in the field of nuclear industry. Their "raison d'être" was to cope with the loopholes and shortcomings of the nuclear non-proliferation regime. The establishment of the Zangger Committee, and the emergence of the Nuclear Suppliers Group (the London Club) are such developments.[12] Other nuclear-weapon-free zones and the zones of peace in various parts of the globe are also considered within the context of the non-proliferation regime. Similarly, ABACC[13] as the outcome of the bilateral nuclear cooperation agreement signed in 1991 between two threshold states, namely

[10] European Atomic Energy Community.

[11] The Treaty of Tlatelolco emerged as a nuclear-weapon-free zone in Latin America and the Caribbean encompassing a large inhabited region.

[12] The Zangger Committe, named for its Swiss chair Prof. Claude Zangger, and the Nuclear Suppliers Group shared in common the purpose of limiting the transfer of significant material and technology to states that are suspected for being engaged in clandestine nuclear weapons manufacturing.

[13] Argentine-Brazilian Agency for Accounting and Control of Nuclear Materials.

Argentina and Brazil, has become one of the most efficient and successful elements of the nuclear non-proliferation regime.

Notwithstanding the efforts spent for associating the *hold outs* with the non-proliferation principle of the regime, the disclosure of the clandestine nuclear weapons manufacturing programme of Iraq as an *insider* has unequivocally displayed the *weaknesses* of the regime.[14] Successive inspections of the UN Special Commission (UNSCOM) created by the UN Security Council Resolution 687 in the aftermath of the Gulf War in 1991 evidenced that Iraq had long violated its basic undertakings set out in the articles of the NPT. It has then become clear that Iraq procured large amounts of nuclear materials and various technological products from abroad but did not submit them to IAEA inspection. Such an act was strictly prohibited by the terms of the NPT. Iraq "succeeded" to overcome the obstacles set by the international nuclear export guidelines restricting transfers of significant nuclear materials. Hence, neither the binding terms of the NPT nor the "gentlemen's agreements" on nuclear exports have proved successful in hindering a determined state from materializing its nuclear ambitions. This is a dramatic indication of the failure of a "grandiose" regime.[15] This study, therefore, contends that with its present structure *the nuclear non-proliferation regime is at a crossroads,* and that the pace of the developments in this field will determine the fate of the non-proliferation regime which may have serious repercussions for international peace and stability. In conformity with the underlying assumption in this study that the proliferation of nuclear weapons is a serious threat to international peace and stability, it is asserted that *a strengthened nuclear non-proliferation regime will contribute more to the*

[14]Iraq is a state party to the NPT since 1969.

[15]It is interesting to note at this stage that in the nuclear non-proliferation literature the definition of the non-proliferation regime is not unique, especially as regards what the elements of the regime are. Therefore, this study principally aimed at bringing clarity to the context of the nuclear non-proliferation regime. That context determined the ground for further discussion on how to strengthen the regime.

maintenance of international peace and stability. Because, it is equally believed that, *the weaker the regime is perceived by its adherents, the more will be the likelihood of states to defect from the regime*. Such an unwanted developments may prompt more and more states to defect from the regime and to *go nuclear* if they lose their faith in the effectiveness and usefulness of the regime.

Bearing in mind that what is at stake is an international regime, the fundamental characteristics of international regimes are identified in Chapter II in order to become familiar with such concepts as *regime formation, regime effectiveness,* and *regime maintenance*. A clear understanding of these concepts is thought to be useful so as to put forward proposals for strengthening the nuclear non-proliferation regime. Hence, the theoretical discussion in Chapter II cross cutting a wide literature on the theory of international regimes is confined to this limited objective. Extensive and in depth discussion on theory of international regimes is beyond the scope and the purpose of this study. The brief investigation of what the theory of international regimes would imply for strengthening the nuclear non-proliferation regime provided several valuable inferences. One, as Stephen Krasner put it, is to *improve the principles and norms of the regime so as to improve its effectiveness*. This conclusion, however, did not prove feasible for the case of nuclear non-proliferation. Because, the principles and norms of the non-proliferation regime are basically found in the Preamble and the Articles of the NPT, and the NPT is decided to remain in force as it exists "indefinitely and unconditionally" in the Review and Extension Conference held at the United Nations in New York in April/May 1995.[16] The implication of the

[16]Since the entry into force of the NPT in 1970, Review Conferences were held in five-year periods. Issues pertaining to the implementation of the terms of the Treaty as well as the complaints and suggestions of the states party to the Treaty are discussed by and large during these conferences. Opposition of several countries sometimes made it difficult to come up with final declarations. Twenty-five years after the entry into force, states party to the NPT had to decide, according to the Article X(2) of the Treaty, on how to extend the Treaty. Prior to the Extension Conference, some countries held the view that the extension should be made contingent on the fulfilment of certain conditions, particularly by the nuclear-weapons states. But, their hopes did not materialize. No amendment was made in the Treaty articles.

decision is that, what Krasner suggested would hardly be possible.[17] Another deduction from the study of theory of international regimes, *inter alia,* is what Robert Jervis postulated: *perception of the future contingencies may have a strong impact on the maintenance and effectiveness of the regime.* Implication of this deduction for the subject matter of this study is that *unless the non-proliferation regime is strengthened, defects of several militarily significant countries from the regime can be highly likely.*

With these in mind, the principal purpose of this study is to suggest ways for strengthening the nuclear non-proliferation regime. Accordingly, answers are sought to the following questions:

1... What are the elements of the nuclear non-proliferation regime ?

2... What is the significance of the elements of the nuclear non-proliferation regime for the operation and overall effectiveness of the regime ?

3... What are the loopholes and shortcomings of the non-proliferation regime ?

4... What should be done to strengthen the nuclear non-proliferation regime ?

To come up with appropriate proposals to strengthen the nuclear non-proliferation regime, the life-cycles of the regime's elements are analysed. Such a comprehensive research is undertaken in Part II which includes chapters on the *emergence and evolution of nuclear safeguards* (Chapter III) and *the IAEA safeguards documents* (Chapter IV) as well as chapters which cover the *emergence and evolution of the Nuclear Non-Proliferation Treaty* (Chapter V) and the IAEA safeguards document drafted in connection with requirements of the NPT called *the model agreement INFCIRC/153* (Chapter VI). That research revealed the *loopholes and shortcomings* of the non-proliferation regime. It equally revealed that the *attitudes and the official stance of the states concerned had a great impact on the evolution and the effectiveness of the*

[17]Nevertheless, injection of renewed norms, if not principles, into the regime framework could be helpful. This has been an inspiration factor in working out Part III and Part IV of this study.

international efforts for preventing diversion of nuclear energy from civilian to military purposes. The political, economic, military as well as sociological factors which are said to have adversely affected the dispositions of several threshold states vis-à-vis the others that adhered to the NPT are reconsidered in Part III with a view to see what would be achievable for associating these *hold outs* with the basic principles and norms of the nuclear non-proliferation regime. In this regard, the concepts of *nuclear-weapons-free zones and zones of peace* (Chapter VII) as well as studies on *successful regional nuclear restraint agreements* (Chapter VIII) are presented as *auxiliary elements of the nuclear non-proliferation regime.*[18] The issues considered in Part II and Part III prompted further deliberations in Part IV in order to search for the proposals for a fully strengthened and hence effectively functioning nuclear non-proliferation regime. Several issue areas that this study considers within the broader context of the non-proliferation regime are therefore brought into discussion. Accordingly, Chapter IX investigated, first of all, the *prospects for enhanced inspection and verification provisions* under the NPT and the current safeguards agreements. Then, it is basically encharged with suggesting *remedies* to the shortcomings of the IAEA provisions that are largely presented in Part II. Chapter X, on the other hand, covered the *external* issues that are thought to be likely to pose as great a threat to the maintenance and effectiveness of the nuclear non-proliferation regime as the *internal* ones already enumerated. The reason for expanding the scope of the study is that, in the world of 1990s it seems more probable for the nuclear *have-nots* to have access to nuclear material, technology, and know-how if they are determined to manufacture nuclear explosives. Hence, supplementary preventive measures are urgently needed to be taken by the international community. Measures that are discussed in Chapter X are generally accorded, within the non-proliferation community, to have impact on the strength of the non-proliferation regime, even

[18]The logic behind incorporating Part III into this study is indeed as simple as supplementing a malfunctioning mechanism with more operational and more efficient spare parts.

though they may not necessarily be linked to the NPT or the IAEA documents.[19] This study resumed with the Conclusion where an overall evaluation of the study is made and where the answers to the questions presented in the Introduction are outlined. Two Appendices followed suit which are intended to provide the reader with sufficient and understandable technical information about the *characteristics of atomic bombs* (Appendix A) and *manufacturing nuclear weapons* & *nuclear fuel cycle* (Appendix B).

This analytical and descriptive study where states are taken as the unit levels, required references to a good deal of primary sources (mostly the IAEA-UN documentation) and several books which are considered by the author as worthy as primary sources written by the scholars or scientists as Allan McKnight, Lawrence Scheinman, Benjamin Sanders, Jan Prawitz, George Bunn, Roland Timerbaev, Mohamed Shaker, and David Fischer, all of whom have taken active parts in the making of the principal elements of the non-proliferation regime while drafting the articles of the NPT, and the Statute of the IAEA and its safeguards documents. For setting the research on a right track prominent scholars in the nuclear non-proliferation field as Prof. Jozef Goldblat (Geneva Graduate Institute of International Studies); Prof. John Simpson and Dr. Darryl Howlett (Mountbatten Centre for International Studies); Mr. Sverre Lodgaard, Prof. Serge Sur, and Dr. Virginia Gamba (United Nations Institute for Disarmament Research -UNIDIR); Dr. Jan Prawitz (Swedish Institute of International Affairs); Dr. Edward Laurance (Monterey Institute of International Studies); Mr. James Leonard (Washington Council on Non-Proliferation); and Ms. Astrid Forland (University of Bergen) are consulted at different stages of the research either through personal interviews and/or by kindly

[19]Essentials of these issues are: achieving a *comprehensive nuclear test ban treaty*; containing the *flow* of the nuclear fissile material & know-how; halting the production of weapons-usable materials (*cut-off treaty*); gathering reliable *intelligence*; and negative or positive *security assurances* to non-nuclear weapons states by *de jure* nuclear powers.

asking them to comment on the drafts of this study. These consultations, most of which have taken place in Geneva during the author's fellowship at UNIDIR, have been the most helpful in giving the research its final structure. Besides, publications of the Mountbatten Centre for International Studies (Programme for Promoting Nuclear Non-Proliferation -PPNN series)[20] and the publications of the Center for Nonproliferation Studies at the Monterey Institute of International Studies (The Nonproliferation Review) have provided the author with the most sophisticated writings and up-to-date information, and contributed to his comprehension of the problems of nuclear non-proliferation.

[20] PPNN Study Series, PPNN Occasional Papers, PPNN Issue Reviews, and PPNN Newsbriefs.

PART I

THE NUCLEAR NON-PROLIFERATION REGIME :

A THEORETICAL UNDERPINNING

CHAPTER I. THEORETICAL APPROACHES TO NUCLEAR PROLIFERATION : ISSUES & DEBATES

Following the disclosure of the Iraqi clandestine nuclear weapons program, and the evidences that "proved" North Korea's engagements for manufacturing nuclear weapons, the debate over the proliferation policies, which was comparably dormant, has grown substantially in the recent years. Not only these events, but also the declaration of the South African government that they once possessed nuclear weapons but have dismantled the technology and the bombs; and the emergence of three *de facto* nuclear-weapons states namely, Ukraine, Kazakhstan and Belarus, out of the former Soviet Union, also brought about diverse theoretical approaches to the nuclear (non-)proliferation issues. In general, one can identify several schools of thoughts amongst the scholars, scientists, and policy makers regarding their approaches to the proliferation of nuclear weapons. And, these approaches are mainly divided into two broad categories based on whether the scholars and policy-makers think nuclear proliferation is evitable, or inevitable. Accordingly, parties to the debate are further divided within their categories based on what they think might or should happen in the future. Hence, the lines of actions that are likely to be advocated and/or proposed by the proponents of each argument are, in a way, dependent on their expectation about the probability of dissemination of nuclear weapons in the future. Since, he who assumes that the proliferation of nuclear weapons is inevitable may either seek and suggest ways to *manage* proliferation, or may, on the contrary, endorse the idea that presence of nuclear weapons at the hands of many states will *deter* other states from attacking them, and will therefore preserve international stability.[21]

[21] The contention on the fate of nuclear weapons (i.e., whether proliferation is evitable or not) is also an important factor for the maintenance and effective operation of the nuclear non-proliferation regime. As it will be discussed in the next chapter, the degree of coherence of the states around the principles and norms of the non-proliferation regime is dependent, among

A... "Nuclear Proliferation is Evitable...."

Among those scholars and policy makers who believe that nuclear proliferation is evitable, one can clearly identify, first of all, those who believe that proliferation can be halted and rolled back if proper steps are taken. This group of scholars contend that exisiting non-nuclear-weapons states can be persuaded to abstain from developing nuclear weapons. Hence, they believe that nuclear proliferation can be reversed.

i... " Proliferation can be Reversed...."

This group of theorists and policy makers define an all-out winning strategy and believe that nuclear proliferation can be reversed. Amongst them, Thomas Graham, for instance, argues that the battle against nuclear proliferation has gone far better than was previously predicted. Graham believes that international non-proliferation efforts have been extremely successful noting that *winning the battle* is not just theory but it has been a fact, and lists several successes of the non-proliferation regime.[22] These successes, according to Graham, can be outlined as follows:

1... France and China have agreed to sign the NPT;

2... South Africa has abandoned its nuclear weapons program;

3... Approximately 170 countries are parties to the NPT;[23]

4... Argentina and Brazil have agreed to comprehensive safeguards on their nuclear facilities;[24]

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others, on the consideration of states whether the regime is likely to persist or not, and whether it will succeed to undermine the danger of further proliferation, or will fail to do so.

[22]Thomas Graham, "Winning the Nonproliferation Battle", *Arms Control Today*, 1991, vol.7, pp: 8 -13.

[23]The number of the member states to the NPT is reached a figure like 168 with the previous adherence of Kazakhstan, Belarus, and the recent accession of Ukraine in 5 December 1994, during the CSCE summit meetings in Budapest, Hungary.

[24]At the end of the process which has culminated in the signing of the agreement on establishing the Argentine-Brazilian Agency for Accounting and Control of Nuclear Material (ABACC), the Argentine Parliament ratified, in February 1995, the Nuclear Non-Proliferation Treaty. Though the Brazilian Parliament did not take a similar action with regard to the formal accession to NPT,

5... Allied victory in "Desert Storm" in the Persian Gulf led to the destruction of most, if not all, of the Iraqi nuclear facilities and nuclear capabilities. This was followed by the IAEA's successfully conducted challenge and on-site inspections against a hostile state, for the first time in safeguards implementation history.

a... optimistic approach.

The logic of the winning view on nuclear non-proliferation is based on several considerations. In the past decades the proliferation problem has been limited to no more than forty states that were thought to be capable of going nuclear. Most of these states have opted to stay clear of such weapons, including those that were considered possible problem states some twenty years ago (e.g. Argentina, Brazil, South Korea, and Taiwan). Thus, most states have acquired nuclear weapons capacity far more slowly than previously predicted. Alternative sources of power appeared to be more cost effective leading many states to curtail or discontinue nuclear power projects and nuclear research. The high economic cost of developing nuclear weapons, and the strength of international norms against proliferation also appeared to be acting as effective deterrents.[25] There is, therefore, a group of scholars and policy makers who believe that there are rooms for being optimistic about the future of the regime.

b... pessimistic approach.

On the other hand, among the first group who believe that proliferation is evitable and it can be reversed, there are nonetheless those who are rather pessimistic regarding what might happen in the future. These scholars argue that all additional nuclear proliferation should be opposed. For instance, James Leonard,

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their commitments under the terms of the bilateral ABACC agreement is believed to highly satisfy the expectations of the international community in these respects.

[25]Barry R. Schneider, "Nuclear Proliferation and Counter-Proliferation: Policy Issues and Debates", *Mershon International Studies Review*, 1994, No: 38, pp: 209-234.

Adam Scheinman and Ben Sanders see that the Non-Proliferation Treaty is a reality, and they point to the fact that approximately 170 countries have signed the NPT.[26] Having sworn that they would not seek to acquire nuclear weapons, these states must have, accordingly and presumably, put their nuclear installations and all source and fissile materials under the IAEA safeguards inspections. However, the actual implementation reports of the IAEA shows that this is not totally the case for many reluctant states. Therefore, such a circumstance leads a group of concerned scholars and scientists to a certain degree of pessimism.[27] Pessimists, therefore, do equally stress the utmost importance they pay to strengthening the non-proliferation regime with all its aspects, for the effective implementation of the terms of the NPT, and for the proper fulfilment of the requirements of the comprehensive safeguards agreements that must be concluded between the states and the IAEA.

ii... "Selective Proliferation Promotes Stability...."

There is a somewhat contradictory viewpoint to the ones mentioned above coming from a group of scholars and policy makers who confirm that nuclear proliferation is evitable, but also take on a rather selective approach, on the other. The proponents of the selective approach do believe in deliberately permitting some *friendly* states to proliferate while hindering some *hostile destabilizers*. Therefore, they base their argument on a clear differentiation between destabilizing and stabilizing proliferators. According to this point of view, states like Iran and North Korea, for instance, should be prevented from possessing nuclear weapons while not interfering with such states like Ukraine and Pakistan. Since, according to this school

[26]See, James F. Leonard, Adam Scheinman, & Ben Sanders, "Towards 1995: A U.S. Arms Control Agenda for the Run-Up to the NPT Extension Conference", *Consensus Report*, WCNP Working Paper No: 3, Washington Council On Non-Proliferation, Washington, D.C., July 1993; See also, James F. Leonard, "Strengthening the Non-Proliferation Treaty in the Post-Cold War World", WCNP *Working Paper*, No: 1, Washington Council On Non-Proliferation, Washington, D.C., October 1992.

[27]The number of states which have concluded comprehesive safeguards agreements with the IAEA within the time limit prescribed in the Non-Proliferation Treaty is unfortunately is far below the expected number. See Annual Report of the IAEA, 1993, International Atomic Energy Agency Publications, Vienna, Austria.

of thought, the latter two states pose no threat to United States' interests and act as stabilizers off-setting the power of their regional rivals namely, Russia and India. Stephen van Evera and John Mearshimer were among the proponents of this view in the early 1990s.[28] The proponents of this selectivist school suggest that, instead of applying sanctions against any new would-be nuclear state, or trying to dissuade them from taking a nuclear path, each case should be addressed on its own merits. Hence, states that are only looking to protect themselves from a regional threat should be left alone and should be allowed to acquire a nuclear deterrent. In these regards, the so-called selectivists pursue a different type of international nuclear non-proliferation regime that would enable states to *differentiate* between stabilizing and destabilizing nuclear proliferators.

a... doubts about regime robustness.

Such a selectivist view would nonetheless be seriously criticized, first of all, by simply inquiring *regime robustness*. Since, it has been argued in some scholarly writings that compliance with the nuclear non-proliferation regime is weak when compared to the relative robustness of, for instance, the Conventional Arms Reduction Regime, and the Operational Arms Control Regime.[29] Hence, Frank Schimmelfenning pointed out that, the weakness of the nuclear non-proliferation regime consisted of the fact that, in the two years that followed the collapse of the Soviet Union, the majority of the post-Soviet States had not signed the NPT. Thus, Schimmelfenning made this delay a crucial case for the evaluation of the robustness

[28]Stephen van Evera, "Primed for Peace: Europe After the Cold War", *International Security*, 1990, vol: 3, pp:7 -57; John J. Mearshimer, "The Case for a Ukrainian Nuclear Deterrent", *Foreign Affairs*, 1993, vol: 3, pp: 50 - 66;

[29]The Conventional Arms Control Regime is based on the Treaty on Conventional Forces in Europe signed at the Paris CSCE summit by the members of NATO and the Warsaw Pact in 1990. Its basic principles are; non-aggression, a stable balance of conventional armed forces, elimination of capabilities for launching surprise attack. The Operational Arms Control Regime, on the other hand, is based on the Confidence and Security Building Measures of the CSCE, whose principles are; war prevention by reducing the risk of surprise attack, non-aggression, and peaceful settlement of conflicts.

of the non-proliferation regime.[30] It may be interesting to briefly touch upon a debate between two remarkable scholars at this stage in brackets. The article of Schimmelfenning prompted a response from Harald Müller with his article in which he argued that the nuclear non-proliferation regime has been considerably strengthened since early 1991, the date of the revelations about Iraq's nuclear weapons programme.[31] Harald Müller also questioned Schimmelfennig's conception of regime robustness and asserts that what his colleague measured was, in effect, regime attractiveness rather than robustness. Müller then gave his own conception on the same issue in a very comprehensive fashion, and suggested Schimmelfenning to refine his terminology and methodology applied in his research so as to avoid traps that lead, according to Müller, to unjustified conclusions. Counterarguments of Müller have expectedly faced *sur-counter* arguments of Schimmelfenning where he mostly defended his previous position but also acknowledged that Müller's criticism was indeed relevant but not conclusive.[32]

b... doubts about the criteria for selection.

Another point to be critical on the selectivist view would be the necessity to determine the decision-making procedure which would reach a consensus concerning the countries that would be allowed to proliferate. It was not always (and still is not) the case for all the members of the international community to share similar views with regard to the behaviours of other states in the international arena, and the measures, if needed, that should be taken against them. For instance, during the widely opposed aggression of Iraq towards its neighbour Kuwait in August 1990, not all the states adopted similar policies to recognize or to counter

[30]Frank Schimmelfenning, "Arms Control Regimes and the Dissolution of the Soviet Union: Realism, Institutionalism and Regime Robustness", *Cooperation and Conflict*, London, SAGE Publications, 1994, vol: 29, No: 2, pp:115-148.
[31]Harald Müller, "Regime Robustness, Regime Attractivity and Arms Control Regimes in Europe", *Cooperation and Conflict*, London, SAGE Publications, 1995, Vol. 30, No. 3, pp: 287-297.
[32]Frank Schimmelfenning, "New States, Old Regimes, Short Time: A Rejoinder", *Cooperation and Conflict*, London, SAGE Publications, 1995, Vol. 30, No. 3, pp: 299-303.

aggression.[33] Similarly, international collaboration could not be easily achieved over the years for determining and then stopping the Serbian aggression against the other former Yugoslav Republics.[34] The proponents of the selectivist approach should also demonstrate how the international norm against nuclear proliferation can be preserved if it is suddenly acceptable for any state to produce nuclear weapons, provided its leadership is not hostile or aggressive, and what happens if the friendly state that was permitted to acquire nuclear arms changes its leadership, and the new regime is hostile.[35] Moreover, whose friends will be allowed to progress in the nuclear field remains problematic. With the sudden and drastic change in international political structure following the break up of the Soviet Union, old enemies are said to become new friends and even partners, while some good-old friends have lost their significance. Even this much of evidence should accelerate the efforts for halting assistance in the manufacturing process of the weapon *per se*, and the efforts to counter the spread of nuclear technology, know-how and fissile materials that are likely to be destined to being used for non-peaceful purposes.

B... "Nuclear Proliferation is Inevitable...."

The second broad grouping among the theorists and policy makers with respect to their approaches to nuclear proliferation consists of those who share the fundamental view that nuclear proliferation is inevitable. Among them some are

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[33]Particularly in France, there was a strong commitment by a good number of politicians and political institutions as well as the public conscious to urge the French government use its veto power in the United Nations Security Council Resolutions which decided to impose economic embargo against Iraq.

[34]Many influencial states in international politics have long considered the events as internal affairs of Yugoslavia, hence acted accordingly. Such a policy has long stagnated an effective international response to aggression.

[35]One should bear in mind that the Islamic fundamentalists gained support in several states like Egypt, Algeria and Pakistan, of which the latter is strongly believed to have already assembled a nuclear explosive device. Moreover, there are allegations associated with Iran's nuclear activities which mostly center on the recent nuclear engagements with Russia and China, all three of which are party to the NPT. Parties to this nuclear deal cannot perfectly assure the international community that these engagements will not turn out to be a part of the efforts to build a so-called *Islamic bomb* with a universal appeal to the Muslim world. See, Leonard S. Spector, *Nuclear Ambitions: The Spread of Nuclear Weapons 1989-1993*, Westview Press, Boulder: Colorado, 1990.

rather optimistic, and though they perceive that the spread of nuclear weapons is inevitable, they also believe that proliferation can be managed and controlled.

i... "Nuclear Proliferation can be Managed...."

Proponents of this school have formulated policies to contain and manage nuclear proliferation, and they have done a great deal to point to the dangers of nuclear proliferation.[36] Among the international relations theorists, those embracing the realist school (i.e., those who predict that states seek to acquire all appropriate power to solve their security dilemmas in an international system characterized by self-help and anarchy), tend to favour the management approach to nuclear proliferation. They accordingly see nuclear weapons acquisition as normal and inevitable. However, these scholars do also contend that unless controls are imposed, an uncontrolled arms race may result in military postures that may be extremely destabilizing and may indeed lead to war in the event of a crisis in which war might have been avoided if the parties to the conflicts had chosen different military postures.[37] In this regard, the realist theory of international relations does not say that states blindly maximize their power regardless of the consequences. Restraint and coöperation can also increase power. Therefore, states may follow a non-proliferation policy and may join the NPT seeking to manage what is happening in order to ensure their status and power vis-à-vis perceived rivals. Disagreeing this, there are some scholars who believe that the formal acceptance of the nuclear non-proliferation obligation under the NPT could well be used as a stratagem for enhancing one's own ability to mount a nuclear attack or use nuclear

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[36]See for example, Dagobert L. Brito, Michael D. Intriligator & Adele E. Wicks, *Strategies for Managing Nuclear Proliferation*, Lexington, Mass:. Lexington Books,1983; Lewis A. Dunn, 1991, "Containing Nuclear Proliferation", *Adelphi Paper*, No: 263, London: Brassey's for IISS; Leonard Spector, 1992, "Repentant Nuclear Proliferants", *Foreign Policy*, No: 88, pp: 3 -20; Brad Roberts, "From Nonproliferation to Antiproliferation", *International Security*, 1993, vol:1, pp:139 -173.

[37]See, Hedley Bull, *The Control of Arms Race: Disarmament and Arms Control in the Missile Age*, Praeger, New York, 1961; Also see. Thomas Schelling and Morton Halperin, *Strategy and Arms Control*, Twentieth Century Fund, New York, 1961.

means to defend oneself to deter an attack.[38] Thus accepting the NPT and using this formal commitment as a cloak for acquiring the means to manufacture nuclear weapons may enable some states to counter the forces of a nuclear armed antagonist and to intimidate rivals that have chosen to abstain from nuclear weapons in the expectation that the same commitments would be honoured. This perverse motivation is said to have been advanced by many to explain the Iraqi, Libyan, and the North Korean accession to the NPT.[39] Regarding such and the previously mentioned events in the international arena, the view that nuclear proliferation can only be managed gains strength. However, those who hold such a view are not totally pessimistic, since they believe that these events at least raise the level of public consciousness and facilitate the development of ways to prevent the probable worst outcomes, and to keep nuclear proliferation under control.

ii... "Nuclear Proliferation is Favourable...."

Among the scholars and policy makers who share the basic argument that nuclear proliferation is inevitable, there exists one school of thought whose proponents are said to be *pro-proliferationist*. They mainly contend that a certain degree of nuclear proliferation is favourable for the preservation of international security and stability. This is the most controversial view towards nuclear non-proliferation and thus inflicted a fundamental debate among the scholars and policy makers. Though most people believe that there is a common global interest in preventing further nuclear proliferation, it is not in the interest of everybody that the spread of nuclear weapons is not desirable. Therefore, a group of political scientists have argued that further spread of such weapons can be a stabilizing factor in international relations. In this respect, Kenneth Waltz presented the first detailed

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[38]See, Harald Müller, David Fischer & Wolgang Kötter, *Nuclear Non-Proliferation and Global Order*, New York, Oxford University Press for SIPRI, 1994.
[39]Ibid., p. 4.

and forceful set of arguments in favour of nuclear proliferation.[40] Waltz's arguments rest on the "rational model of nuclear deterrence" which is often credited with preserving peace between superpowers. Therefore, Waltz questions, "If nuclear weapons produced prudence between the two antagonistic superpowers, why would they not do the same for other nations ?" The same apparent contradiction which lies at the center of this understanding about nuclear weapons is also emphasized by Scott D. Sagan.[41] However, Sagan argued that, while on the one hand it is widely believed that nuclear weapons were an important factor in maintaining the long peace between the superpowers during the Cold War and avoided war despite a deep geopolitical rivalry and repeated crisis, it is also believed, on the other hand that the continuing spread of nuclear weapons will greatly increase the risks of nuclear war.[42]

Those political scientists, whose conceptualization is in favour of a certain degree of proliferation for preserving political stability throughout the world, base their argument on the contradiction between the peaceful nuclear past and a fearful nuclear future. Among them, Bruce Bueno de Mesquita and William Riker, for instance, advocated proliferation of nuclear weapons into areas where non-nuclear-weapons states face nuclear armed adversaries. They assert that the chances of a bilateral conflict to become nuclear decrease to zero when all nations are nuclear armed.[43] By the same token, John Mearshimer perceives nuclear weapons as a "superb deterrent" and argued that Germany and Ukraine should be encouraged to

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[40]Kenneth Waltz, "The Spread of Nuclear Weapons: More May be Better", *Adelphi Paper*, No:171, 1981, London- Brassey's, for IISS.
[41]Scott D. Sagan, "The Perils of Proliferation", *International Security*, Spring 1994, vol:18, No: 4, pp: 66 -107.
[42]For the revised version of the fundamental debate between two scholars see also, Scott D. Sagan & Kenneth Waltz, *The Spread of Nuclear Weapons: A Debate*, W. W. Norton & Company, New York, London, 1995.
[43]Bruce Bueno de Mesquita & William Riker, "An Assessment of the Merits of Selective Nuclear Proliferation", *Journal of Conflict Resolution*, June 1982, vol: 26, p. 283.

become nuclear weapons powers in the post-Cold War era.[44] Similarly, proponents of this view believe that proliferation of nuclear weapons in regional conflicts such as the ones between India and Pakistan, and Israel and its Arab neighbours, may create a degree of peaceful regional nuclear balances. For instance, Shai Feldman, a notable Israeli scholar, argues that an open declaration of Israeli nuclear capability would give Israel the necessary confidence to make further concessions in the Middle East Peace Process.[45]

Returning to Waltz's position in the debate, he underlines the fact that, one may not like the political positions of the leaders in proliferating states, however, these leaders are (for Waltz) quite capable of ends-means rationality. Since nuclear weapons can have effects out of proportion to any political goals that a leader could set, therefore, such a simple end-means rationality is all that is needed. Moreover, Waltz postulates that, as long as countries have invulnerable *second strike* nuclear forces, there is no reason why the rational model of nuclear deterrence cannot spread around the world. Since, by the late 1960s, the arms race between the United States and the Soviet Union had reached such a level that none of the parties could attain superiority on the other due to their capability to make the second-strike, that is to retaliate after absorbing a considerable nuclear attack from the adversary, and cause an *unacceptable damage* in return.[46] Hence, the nuclear 'game' has come to a

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[44] John J. Mearshimer, "Back to the Future: Instability in Europe After the Cold War", *International Security*, Summer 1990, vol:15, No: 1, pp :5 -56.

[45] For a detailed elaboration of the Israel's nuclear strategy as an element of foreign policy, see Shai Feldman, *Israeli Nuclear Deterrence: A Strategy for the 1980s*, New York: Columbia, Columbia University Press, 1982. For a comprehensive coverage of these troublesome regions of the world regarding the arms proliferation, see Shelly A. Stahl & Geoffrey Kemp (eds.), *Arms Control and Proliferation in the Middle East and South Asia*, New York, St. Martins Press, 1992.

[46] Though, no single precise definition could give an idea about what would be the "unacceptable damage" in military and economic as well as sociological terms, one may, however, consider it as causing a casualty rate as high as 25 percent of the whole population, and devastating almost 75 percent of the industrial bases, cities, and military-strategic centers including command and control systems. Therefore, building up such a mighty second-strike capability constituted the principal deterrent asset of both superpowers during the Cold War.

stalemate because of that *delicate balance of terror*.[47] It was the result of vertical proliferation of nuclear weapons, that is the rapid increase in the nuclear arsenals and their respective delivery systems of superpowers.[48]

iii... A Counterargument

A counterargument to Waltz's thesis came from Joseph Nye who believes in the importance of political stability, and that stable deterrence would be created only if the political and military conditions that created nuclear stability between the Cold War superpowers existed.[49] This is also the point of view which is shared to a great extent and advocated throughout this dissertation. Since the existence of the conditions that Nye has emphasized is not the case for the developing countries, and since revolutions, civil wars and coups may increase the likelihood of nuclear weapons being used because of the non-existence of political stability of the governments controlling the weapons, then the spread of nuclear weapons would nonetheless constitute a danger for international security. A similar problem rests on the concept of strategic stability. Since it was not merely the existence of nuclear arsenals of both superpowers that created stability, but it was their capability to make the second-strike in retaliation to a nuclear attack from the adversary (a point that Waltz also stressed), then it must be well acknowledged that the rules of such a dangerous game were learned over the years by its players. Therefore, it is hardly

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[47]Indeed, "The Delicate Balance of Terror" was the title of a famous essay written by Albert Wohlstetter in 1959, who was one of the United States' national security analysts working at the RAND Corp. According to Wohlstetter, international stability would be best preserved, not by achieving a nuclear superiority and thus a great advantage over the other to strike the first under the conditions of mutual vulnerability, but rather by building a relatively secure second-strike capability. In fact, the article that was published in *Foreign Affairs* was only a late summary of a confidential RAND research on overseas bases, undertaken in the mid-1950s. Henceforth, US governments had revised the deployment of their strategic forces accordingly.

[48]Maintaining such a balance required further precision in military strategies, and improvement in the command and control mechanisms of the elaborate weapons systems at the disposal of both parties. Therefore, the nuclear game was considered to be too sophisticated and too costly that could only be played by the superpowers.

[49]For an excellent elaboration of Waltz's arguments see, Joseph S. Nye. Jr., "The Case for Concern: Is Non-Proliferation Policy Mistaken ?" *Harvard International Review*, Spring 1992, vol:14, No: 3, p. 8.

probable for a Third World and/or developing country to build an invulnerable second-strike capability and the necessary elaborate systems of command and control, and special safety devices to reduce the risk of an unintentional nuclear war. Moreover, the requirements of a truly multi-nuclear world with respect to command, control, communications and intelligence (C^3I) would be awesome, and the international stability would suffer. On the other hand, the existence of terrorist groups and the possibility of acquisition of nuclear weapons by them might further endanger the international peace and security. That is, in case nuclear weapons are either sold to or stolen by terrorist groups, since they would have no specific headquarters or homeland, then the threat of retaliation argument would become ineffective.

In regard to what has been said above, one may reach a conclusion that nuclear weapons have kept the peace during the Cold War due to a particular set of conditions. Though there may be some regional situations where analogies can be made to superpower confrontation, most appear to be very different. Hence, even if there is some chance of developing stable nuclear balances in South Asia and the Middle East, there are also higher risks of a nuclear exchange. The more nuclear weapons are held within different political jurisdictions, the greater the probability that turmoil or technological faults can lead to their loss or unauthorized use. Hence, whatever happens between the established nuclear-weapons states, the world will be a more stable one if the number of nuclear-weapons does not grow.

CHAPTER II. THE INTERNATIONAL REGIMES THEORY & THE NON-PROLIFERATION REGIME

The task undertaken in this chapter is to introduce the concept of international regimes with a view to accentuate the regimes' significance in promoting international cooperation and collaboration in different issue areas including the efforts to prevent further spread of nuclear explosive devices.[50] In this regard, the concept of the formation and persistence of international regimes need to be elaborated to some extent, so that the concept of security regimes can then be brought to the fore in order to lay the ground for further discussion on the nuclear non-proliferation regime in the following chapters.

A... Definition of International Regimes

According to Stephen Krasner as a leading scholar in the field of international relations, international regimes are implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge in a given issue area of international relations. Principles are beliefs of facts, causation and rectitude. Norms are standards of behaviour defined in terms of rights and obligations. Rules are specific principles of action. Decision-making procedures are prevailing practices for making and implementing collective choice.[51] According to Etel Solingen, on the other hand, the definitional requirements of an international regime imply mutual policy adjustments by each participating state, geared to

[50]A nuclear explosive device does not necessarily mean a nuclear weapon. However, particularly in the Treaty on the Non-Proliferation of Nuclear Weapons, any request of or offer for assitance in the manufacture of nuclear explosive devices, whether or not intended to peaceful purposes, are prohibited. The purpose behind such a restriction was the clear cut understanding that there was indeed no distincition between the two devices (a peaceful device or a weapon) based on the destructive effect they could produced in case they would be used for military purposes. Only slight modifications would be needed to transform a so-called peaceful nuclear explosive device into a lethal nuclear weapon.

[51]Stephen D. Krasner (ed.), *International Regimes*, Cornell University Press, Ithaca: New York, 1983, pp. 1 - 21.

improve the position of all sides, through a joint policy process of coordination and collaboration, generally underpinned by an institutional foundation of principles, rules, and decision making procedures.[52] International regimes have been conceptualized as *intervening variables* standing between *basic causal factors* on the one hand, and *outcomes and related behavior* of the states on the other.

i... Relationship Between Basic Causal Factors and Regimes

There has been several basic paradigmatic debates among the scholars about the nature of international relations which related to basic causal factors. Regarding the relationship between these factors and international regimes, a fundamental question, such as the following, can be posed: *what are the conditions that lead to regime formation, regime continuance, and dissolution of regimes ?* In a narrow explanation, these factors can be reduced to three: interest, power, and values.

a... interest

The most widespread explanation for the formation and continuance of international regimes is *egoistic self-interest* of the actors in the international scene. In this regard, Stephan Krasner refers to the desire to maximize one's own utility function where that function does not include the utility of another party.[53] In the same regard, Arthur Stein postulates that the same forces of autonomously calculated self-interest that lie at the root of the anarchic international system also lay the foundation for international regimes as a form of international order. That is to say, according to Stein, the same forces that lead individuals to bind themselves together to escape the state of nature also lead states to coordinate their actions, even to collaborate with one another. Quite simply, there are times when rational

[52]Etel Solingen, "The Domestic Sources of Regional Regimes : The Evolution of Nuclear Ambiguity in the Middle East", *International Studies Quarterly*, 1994, Vol: 38, No: 2, pp: 305 - 337.
[53]Krasner, ibid., p. 11.

self-interested calculation leads actors to abandon independent decision making in favor of joint decision making.[54] On the other hand, Robert Keohane is primarily concerned with the demand for regimes, the conditions under which *ad hoc* agreements fail to provide optimal outcomes. Keohane maintains that regimes can make agreements easier if they provide frameworks for establishing legal liability; improve the quantity and quality of information available to actors; or reduce transaction costs (e.g., costs of organization or of making side-payments). Keohane also points out to the importance of the regimes in providing established negotiating frameworks.[55]

Egoistic self-interest is also regarded as an important determinant of regimes by other authors, such as Oran Young. According to Young, international regimes are those pertaining to activities of interest to members of the international system, and some of these activities involve actions with a direct impact on the interests of two or more members of the international community. Like other social institutions, Young believes, international regimes develop and evolve over time, and it therefore becomes important to think about the development patterns or life-cycles of regimes. It is also important to account for the emergence of any given regime, and to detect what factors determine whether an existing regime will remain operative over time. Therefore, Oran Young argues that, there are three paths to regime formation.[56] Accordingly, regimes can either be created *spontaneously*[57]

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[54]Arthur A. Stein, "Coordination and Collaboration: Regimes in an Anarchic World", in Krasner (ed.), ibid, pp: 115 - 140.

[55]Robert O. Keohane, "The Demand for International Regimes", in Krasner (ed.), ibid., pp: 141-171.

[56]Oran Young, "Regime Dynamics: the Rise and Fall of International Regimes", in Krasner (ed.), ibid., pp: 93 - 115.

[57]Such social institutions are distinguished by the fact that they do not involve conscious coordination among participants, do not require explict consent on the part of subjects or prospective subjects, and are highly resistant to efforts at social engineering. In fact, there are numerous cases in which subjects' expectations converge to a remarkable degree in the abscence of conscious design or even explicit awareness. To Young, this is an appropriate interpretation of many balance of power situtations at the international level. See, Oran Young, ibid., p. 98.

emerging from the converging expectations of many individual actions, or can be *negotiated*[58] and formed, based on explicit agreements, or, can be initally forced upon, and externally *imposed*[59] by some actors in the international system.

From the point of view of nuclear non-proliferation, the concept of interest, or the so-called egoistic self-interest of states, can be considered as one of the basic causal variables, whereas the non-proliferation regime as the dependent variable. Withstanding the arguments of Krasner and Stein in particular, some states sought in the past (and still at present) to maximize their own utility function in the field of nuclear energy regardless of the utility of other states. Hence, the chaotic structure of the international relations especially in the 1960s led different states, as forwarded by Keohane, to make agreements for establishing frameworks so as to come up with a legal liability in the nuclear field. The outcome was the Nuclear Non-Proliferation Treaty which theretofore constituted the crux of the nuclear non-proliferation regime. The emergence of the non-proliferation regime in general, and the creation of the NPT in particular, were indeed the results of, on the one hand, the enduring negotiation processes over the years in different international gatherings, and the result of imposition of the leading states on the other (particularly the two hegemonic powers, namely the US and the USSR). Thus, one may conclude that, both the outcomes of the negotiations, and the impositions of superpowers have been influencial in shaping the nuclear non-proliferation regime and its elements.

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[58]In contrast to spontaneously formed regimes, negotiated regimes are characterized by conscious efforts to agree on their major provisions, explict consent on the part of individual participants, and formal expression of the results. Comprehensive regimes sometimes emerge from careful and orderly negotiations. Negotiated orders are relatively common at the international level. Therefore, Young points out to the fact that there is some tendency to become so involved in thinking about negotiated regimes in this domain that it is easy to forget that other types of regimes are also prominent in the international system. See, Young, ibid.,

[59]Imposed regimes differ from spontaneous orders in the sense that they are fostered deliberately by dominant powers or consortia of dominant actors. At the same time, as Young postulates, such regimes do not involve explict consent on the part of subordinate actors, and they operate effectively in the abscence of any formal expression. Of two types of imposed orders, namely overt hegemony and *de facto* imposition, the latter refers to situations in which the dominant actor is able to promote institutional arrangements favorable to itself through various forms of leadership and the manipulation of incentives. See, Young, ibid.,

b... power

The second major basic causal variable used to explain regime development is political power. Power can either be used to enhance the values of specific actors within the international system, or it can be used to secure optimal outcomes for the system as a whole. Therefore, power is either an individualistic or a collectivist instrument in achieving specific goals. Scholarly writings that focus on power suggest that under certain configurations of interest, there is an incentive to create regimes and the provision of these regimes is a function of distribution of power. Robert Keohane, for instance, in his "theory of hegemonic stability", put forward that hegemons play a critical role in supplying the collective goods that are needed for regimes to function effectively. However, hegemons provide these goods not because they are interested in the well-being of the system as a whole, but because regimes enhance their (hegemons') own national values.[60] The line of argument associated with individualistic power elaborates on the likelihood of altering the strategies of weaker actors by the powerful actor(s). In such contingencies, power becomes much more a central concept, or rather an element of compulsion. In investigating the process through which the nuclear non-proliferation regime has come about, power of the two hegemons in particular, and the respective powers of several other influencial states such as Great Britain, France, F. R. Germany, Sweden, Canada, and India in general, prevailed as determining factors in the formation of the norms, rules, and decision-making procedures of the regime. There was almost unanimous agreement on the non-proliferation principle.

c... values

Values embedded in the principles and norms of a regime, which are critical in defining the characteristics of any given regime, and which influence a regime in a

[60]See, Robert O. Keohane, "The Theory of Hegemonic Stability and Changes in International Economic Regimes, 1967-77", in Ole R. Holsti *et al.*, *Changes in the International System*, Boulder, Colorado, Westview press, 1980.

particular issue-area, may not be directly related to that issue-area, but they can be regarded as explanations for the creation, persistence, and dissipation of regimes. Diffuse principles and norms in the societies may condition international behavior in specific issue-areas. In International relations, the most diffuse principle is sovereignty. However, sovereignty is not an analytic assumption but a principle that influences the behavior of actors. According to Krasner, in areas where sovereignty is not applied are either governed by vulnerable regimes or lack of regimes. The principle of sovereignty has been a major issue of concern during the multilateral negotiation process of controlling the world-wide proliferation of atomic energy.

ii... Relations Between Regimes and Outcomes & Behavior

As stated at the beginning, international regimes are said to be intervening variables between basic causal factors and related outcomes and behaviors of states in the international arena. Thus far, the relationships between basic causal factors and international regimes were briefly investigated also from the point of view of their significance for the emergence and evolution of the nuclear non-proliferation regime. Now, the right-hand side of the relationships, i.e., the ones between international regimes and related outcomes and behaviors of states, need some elaborations.

a... "regimes and behaviors are inextricably linked ..."

For some scholars like Oran Young, Donald Puchala and Raymond Hopkins, international regimes and behaviors of states are inextricably linked. All three contended that, regimes are pervasive phenomenon of all political system, and that, no patterned behavior can sustain itself for any length of time without generating a congruent regime. Puchala and Hopkins believe that, regimes exist in all areas of international relations, even those, such as major power rivalry that are traditionally looked upon as clear cut examples of anarchy. They further argue that, statesmen almost ever perceive themselves as constrained by principles, norms, and rules that prescribe and proscribe (condemn) variaties of behavior. Hence, the concept of regime moves beyond a realist perspective which, Puchala and Hopkins believe, is too limited for explaining an increasingly complex, interdependent, and dangerous world. According to them, their argument is not only applicable to areas where one might expect communalities of interest, but also to ones where conflictual relations would normally be expected. They also believe that, taking regimes into account contributes to explaining international behavior by alerting students of international relations to subjective and moral factors that they might otherwise overlook. And, once this subjective dimension of international relations is included, explanations of international behavior can be pushed beyond factors such as goals, interest, and power.[61] In the same regard, Oran Young argues that patterned behavior inevitably generates convergent expectations, and this leads to conventionalized behavior in which there is some expectation of condemnation for deviating from ongoing practices. In other words, patterns of behavior that persist over extended periods are infused with normative significance, and tend to lead to the creation of regimes, and in turn, regimes reinforce patterned behavior.

b... "regime is a misleading concept ..."

In contrast to what has been said above, a few scholars such as Susan Strange argue that regime is a misleading concept that obscures the basic economic and power relationships, and also rejects that principles, norms, rules, and decision-making procedures have significant roles in international relations. Thus, instead of asking what makes regimes and how they affect behavior, Strange raises a more fundamental question as whether the concept of regime is really useful to students

[61]In international relations, there are, according to Hopkins and Puchala, revered principles, explicit and implicit norms, and written and unwritten rules, that are recognized by actors that govern their behavior. Hence, adherence to regimes may impose a modicum of order on international interactions and transactions. See, Raymond Hopkins & Donald Puchala, ibid., p. 86.

of international political economy or world politics by challenging the validity and usefulness of the regime concept on five separate counts.[62] In this school of thought, it is believed that regimes, if they can be said to exist at all, have little or no impact. They are merely epiphenomenal, and the underlying causal schematic is one that sees a direct connection betwen changes in basic causal factors and changes in behavior and outcomes.[63] In other words, all those international arrangements dignified by the label regime are only too easily upset when either the balance of bargaining power or the perception of national interest change among those states who negotiate them. Hence, in this approach, international regimes are either excluded completely, or their impact on outcomes and related behavior of states is regarded as trivial.

c... "regimes coordinate behavior to achieve desired outcomes ..."

In explaining the significance of the relationship between international regimes and outcomes and related state behavior, proponents of a third approach argue that, in the international system, regimes derive from voluntary agreements among juridically equal actors.[64] Looked from a realist perspective, in a world of sovereign states, each actor seeks to maximizing its interest and power. And, the basic function of regimes is to coordinate state behavior to achieve desired outcomes in particular issue-areas. Such coordination, according to Keohane and Stein, is attractive under several circumstances such as when Pareto-optimal outcomes cannot be obtained through uncoordinated individual calculations of self-interest. Regimes cannot be relevant for zero-sum situations in which states act to maximize the difference

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62The five counts, what Susan Strange calls "dragons", are that, the study of regimes: is, for the most part, a passing fad; is imprecise and woolly; value-biased, as dangerous as loaded dice; distorts by overemphasizing the static and underemphasizing the dynamic element of change in world politics; and is narrowminded, rooted in a state-centric paradigm that limits vision of a wider reality. See, "Susan Strange, Cave! Hic Dragones: A Critique of Regime Analysis", in Krasner (ed.), ibid., p. 337.
63Strange, ibid., p. 345.
64Keohane, ibid., p. 146.

between their utilities and those of other. Hence, Robert Jervis points to scarcity of regimes in the security area, which more closely approximates zero-sum games than do most economic issue-areas. In such circumstances, pure power motivations preclude regimes. Thus in this third approach, regimes are seen as emerging and having a significant impact, but only under restrictive conditions.[65]

B... Definition of the Nuclear Non-Proliferation Regime

As the result of the developments taken place within a quarter of a century in the aftermath of the Second World War, the Treaty on the Non-Proliferation of Nuclear Weapons came into being in July 1968 and entered into force in March 1970. According to the Non-Proliferation Treaty, the states that have not hitherto possessed nuclear weapons were required to accept the comprehensive safeguards of the International Atomic Energy Agency which was created in 1957 and mandated principally with furthering the peaceful uses of nuclear energy, promoting nuclear safety, and applying safeguards in order to verify that nuclear materials were not being used to make nuclear weapons. Creation of a universal treaty fostered the formation of an international regime in the domain of nuclear proliferation whose principles, norms, rules and decision-making procedures, as well as its constituent elements could be defined. The nuclear non-proliferation regime constitutes a substantial accomplishment in institutionalizing a collective interest, and it has evident successes to its credit in slowing the pace of weapons spread.[66]

i... Non-Proliferation Principles

The principles of an international regime reflect the aims and the premises of the members of the regime, and the purposes the members are expected to pursue.

[65]Krasner, ibid., pp: 7 - 8.

[66]Michael Brenner, "Progress and U.S. Nonproliferation Policy", in Emanuel Adler & Beverly Crawford (eds.), *Progress in Postwar International Relations*, Columbia University Press, New York, 1993, p. 176.

They are mostly expressed in the preambles of the treaties. The basic principles of the nuclear non-proliferation regime have been set forth in the belief that the proliferation of nuclear weapons would seriously enhance the danger of nuclear war. Whereas, the benefits of peaceful applications of nuclear technology should be available to all parties to the NPT. Furthermore, the cessation of the manufacture of nuclear weapons, the liquidation of all of the existing stockpiles and the elimination of nuclear weapons from national arsenals for general and complete disarmament, and strict and effective international control in these regards are the principal desires as well. The fundamental aim of a comprehensive regime would thus be to contribute to the realization of the purpose and principles of the United Nations Charter in general, and the prohibition and elimination of all weapons of mass destruction in particular.[67] Therefore, as its guiding principle, the nuclear non-proliferation regime presumes that the spread of nuclear weapons into many hands would further jeopardize prospects for international peace and security. Consequently, the appropriate behaviour for nuclear armed states would be to not assisting others in attaining a similar capacity, and for states without a nuclear armory to forego acquiring one.[68]

ii... Non-Proliferation Norms

The norms of an international regime can be regarded as a mandate for the rules and procedures of the regime. They indicate what members of the regime must or must not do, that is, what is legitimate or illegitimate.[69] The general principles of the non-proliferation regime have been translated into specific norms

[67]Thomas Bernauer, *The Chemistry of Regime Formation*, UNIDIR, Dartmouth: Aldershot, 1993, p. 55.
[68]The hypothesized cause-and-effect relationship underlying this presumption is that while weapons, even nuclear weapons *per se*, do not cause conflict, they can significantly exacerbate tensions, since there exists the destructive potential of such weapons. Roger K. Smith, 1987, "Explaining the Non-Proliferation Regime: Anomalies for Contemporary International Relations Theory", *International Organization*, Vol. 41, No: 2, pp: 253-281.
[69]Bernauer, ibid., p. 56

through two sets of institutions: first, the series of treaties banning the deployment of weapons of mass destruction from set geographical boundaries, such as the Antarctic Treaty of 1959, the Outer Space Treaty of 1967, and the Seabed Arms Control Treaty of 1972; and secondly, the Nuclear Non-proliferation Treaty of 1970. The more important institution is the Non-Proliferation Treaty, for it explicitly lays out the essence of the *nuclear bargain* between the nuclear *haves* and *have nots*.[70] Thus, the basic norms of the nuclear non-proliferation regime is the clear cut *differentiation* of non-nuclear weapon states from nuclear weapon states, and their respective rights and liabilities defined in the first three Articles of the NPT.[71] The basic bargain that the NPT signifies was that, in return for foregoing the acquisition of nuclear weapons, the non-nuclear weapons states extracted from the nuclear states a commitment to provide them nuclear technology suitable for the development of their nuclear industries. Then, underlying the explicit bargain was a tacit agreement: non-nuclear weapons states would not seek to acquire nuclear weapons so long as the nuclear states sustained a robust and expanding international economy and a system of relative free trade in conventional weaponry.[72] Such a reasoning would stem from a *de facto* situation as that, if conventional arms were not provided to the non-nuclear weapons states, then there would be strong incentives for them to acquire nuclear weapons. It may be argued that, the more acutely vulnerable a state considers itself to a massive conventional attack, the less likely is it to renounce a nuclear deterrent. However, there are countries which had both a well organized conventional armory but also strong incentives for *going nuclear*.[73]

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[70] Smith, ibid.,

[71] Accordingly, a nuclear weapon state undertakes not to transfer any nuclear weapon or other nuclear explosive devices directly or indirectly to any non-nuclear weapon state, while a non-nuclear weapon state party to the NPT undertakes not to receive the transfer of nuclear weapons or other nuclear explosive device from other countries.

[72] Smith, ibid.,

[73] The motives and incentives behind the political will of these countries which made them go nuclear can be enumerated as territorial disputes, ethnic conflicts, religious animosities, and

iii... Non-Proliferation Rules

The rules of an international regime are prescriptions and guidelines for actions the member states are expected to perform or refrain from performing. They define the relevant actors, the expected behaviour, and the specific circumstances under which the rules are operative. Rules make the principles and norms operational, measurable and verifiable, and they institutionalize procedures. Rules are often established by an international treaty. They may, however, also be issued, supplemented or expanded by an international or a supranational authority.[74] The IAEA Safeguards pursuant to the documents INFCIRC/66 and INFCIRC/153, and the IAEA Statute describe the rules that the member states to the Non-Proliferation Treaty and those otherwise accepted the IAEA safeguards agreement must follow in using nuclear energy. A group of nuclear suppliers states put some restrictions on certain items that might also be used to advance non-peaceful nuclear programs. Such restrictions, or item lists, constitute the basis for the rules set forth by the non-proliferation regime.

iv... Non-Proliferation Decision-Making Procedures

Decision-making procedures of an international regime are those mechanisms that deal with situations requiring collective choice, which may, for example, be necessary to amend or interpret the principles, norms, rules or procedures of the regime, and to deal with compliance issues, including monitoring, verification and sanctions against violators.[75] In this regard, implementation of safeguards procedures by the IAEA pursuant to INFCIRC/66 or INFCIRC/153 requires monitoring the activities of the member states by a group of inspectors. In case of

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ambitions to gain universal recognition and prestige. Some infamous proliferators from different regions of the world such as, Israel, Iran, Iraq, Libya, India, Pakistan, and North Korea, may be counted. For an excellent compilation of the states that have gone nuclear see, Leonard S. Spector, *Going Nuclear*, Cambridge, Mass. : Ballinger Publishing Co. 1988,

[74] Bernauer, ibid., p. 57.

[75] Bernauer, ibid., p. 59.

non-compliance determined by the inspectors, it is the task of the Director General of the IAEA to call for that state to come to line with its obligations under the Treaty. If a state fails to comply with the terms of the Treaty, Director General brings the case to the attention of the IAEA's Board of Governors, which adopts a set of measures in order to make that state comply with its obligations. In case of failure again, the Board can bring the case to the attention the UN Security Council.

v... Elements of the Nuclear Non-Proliferation Regime

The foremost principal elements of the nuclear non-proliferation regime are the Nuclear Non-Proliferation Treaty, and the International Atomic Energy Agency and its Statute. Apart from these two 'backbones' of the regime, several other institutions are established, either formally or informally, with the purpose of preventing the further spread of nuclear weapons, and/or the spread of nuclear material and technology used in the manufacture of nuclear explosives. Some of these institutions, such as EURATOM, and the Treaty of Tlatelolco were established prior to the efforts to work out the Non-Proliferation Treaty. Some other important elements of the regime are established as reactions to the post-NPT developments in the field of nuclear industry. Their "raison d'être" was said to cope with the loopholes and shortcomings of the regime. The establishment of the Zangger Committee, and the emergence of the Nuclear Suppliers Group (NSG or the London Club) are such developments. Other regional/multilateral attempts to prevent further nuclear proliferation that can be cited here are the efforts to establish other nuclear-weapons-free zones and the zones of peace, such as the African Nuclear-Weapon-Free Zone, and the South Pacific Zone of Peace. Similarly, the bilateral regional nuclear cooperation arrangement between two threshold states, namely Argentina and Brazil (ABACC), has become one of the most efficient and succesful elements of the nuclear non-proliferation regime. The above mentioned elements of the regime will be elaborated in the following parts of this study with a view to see what can be achievable among the states in order to prevent the spread of nuclear weapons and nuclear material and techonology. Insights to be gained from such an elaboration may shed light to the proposals for strengthening the non-proliferation regime.

C... Concept of Security Regimes

As it was previously stated above, a wide range of authors have proceeded to identify regimes in different issue areas such as money, trade, oceans and environment. However, little scholarly analysis have been devoted to the study of regimes in the domain of security. One principal exception to this general rule, came about as the original work of Robert Jervis. Jervis suggests that the lack of scholarly study is not the result of neglect but rather inherent in the nature of the subject. The reason why there is little security regime analysis is because regimes are more difficult to establish in the security area than in the economic realm because of the inherently competitive character of security concern, the unforgiving nature of the problem, and the difficulty in determining how much security the state has or needs.[76] Similarly, the works of Harald Müller[77] particularly those concerning the formation and the operation of the nuclear non-proliferation regime, and the works of Thomas Bernauer[78] who analysed the "chemistry of regime formation" in the field of chemical weapons, are more recent and comprehensive studies in the field of security regimes. Harald Müller defines security regimes as systems of principles, norms, rules and procedures regulating certain aspects of security relationships between states. According to Müller, an international regime exists when all four elements can be identified and when the regime controls enough variables in a given issue-area to affect (if obeyed) parties' behavior by channelling or terminating

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[76]Robert Jervis, "Security Regimes", in Stephan D. Krasner (ed.), *International Regimes*, Cornell University Press, Ithaca: New York, 1983, pp. 173-194.
[77]See, Harald Müller, "The Internalization of Principles, Norms and Rules by Governments: A Case of Security Regimes", in Volker Rittberger (ed.), *Regime Theory and International Relations*, Clarendon Press, London, 1993.
[78]Thomas Bernauer, *The Chemistry of Regime Formation*,

unilateral self-help with regard to regulated variables. Using these criteria, Müller identifies the following existing security regimes: the strategic nuclear weapons regime;[79] the European military order;[80] the regime for the prevention of nuclear war;[81] and the nuclear non-proliferation regime.[82] Given the general criteria used to confirm the existence of an international regime in the field of nuclear non-proliferation, there is indeed a regime with its existing principles, norms, rules, and decision-making procedures. As most regime analysis have studied international economic issues, the criteria they developed may not be completely appropriate to security regimes. Therefore, in order to examine whether the international arrangements over nuclear non-proliferation conform to the prerequisites established for the existence of a security regime, it would be, first of all, useful to understand the nature of security regimes in general.

i... Robert Jervis and the Concept of Security Regimes

For Jervis, a security regime means those principles, rules and norms that permit nations to be restrained in their behavior in the belief that others will reciprocate. This concept implies not only norms and expectations that facilitate cooperation, but a form of cooperation that is more than the pursuit of short-run self-interest. If patterns of international relations can be explained by the distribution of military and economic power among the states, than the concept of regime will not be useful. However, if the connections between outcomes and national power are indirect and mediated, then there is more room for choice, creativity, and

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[79]SALT I and II, ABM Treaty, parts of INF Treaty and of the Outer Space Treaty, and START. Müller, ibid., 361.

[80]INF Treaty, Stockholm/Paris agreements on confidence-building, CFE Treaty, 2+4 Treaty, practices such as doctrine seminars and mutual visits of military personnel, the Crisis Control Centre, and the recent mutual promises of unilateral reductions of short-range nuclear weapons. Müller, ibid., pp: 361 - 362.

[81]More than ten different agreements, aspects of the SALT Treaties and the adopted practice of not keeping nuclear weapons in a high state of readiness. Müller, ibid.,

[82]The NPT, The London Suppliers' Guidelines, the IAEA Statute, the safeguards rules in INFCIRC/66 and INFCIRC/153, the Tlatelolco and Rarotonga Treaties. Müller, ibid., p. 362.

institutions to restrain and regulate behavior, and consequently, there is room for producing a security regime.[83]

a... differences between security and non-security regimes

Security regimes, according to Jervis, are both especially valuable, and especially difficult to achieve. Security regimes are valuable because individualistic actions are not only costly but also likely to yield dangerous outcomes. And, security regimes are difficult to achieve because the fear that the other is violating or will violate the common understanding is a potent incentive for each state to strike out on its own, even if it would prefer the regime to prosper. Even though, these dynamics can be present in non-security areas as well, there are four main differences between the regimes in security and non-security issue-areas. First, security issues often involve greater competitivenes than do those involving economics. The second difference is linked to the problem that, conflicts can be inherent between the states as regards the security issues. Offensive and defensive security motives of states often lead to a security dilemma, a concept which is central to many other aspects of interstate relation.[84] Since, the policies that are said to enhance the defensive structuring of a state may be perceived as a threat by another state, then one state's security may be seen and defined as another state's insecurity. Hence, from such a web of relations a "security dilemma" may arise.[85] A third

[83]Jervis, ibid., pp: 173 - 174.

[84]As discussed by Bruce Russett and Harvey Starr, as a consequence of an international system composed of sovereign states, each state must in the end look out for its own security, protection and survival. If there is no legitimate authority to enforce order and punish rule breakers then there is no legal or formal recourse if allies and friends fail to assist a state. Thus, self-help in the international system means that each state must take measures to provide its own defense. A tragic flaw of the formally anarchic state system is that the requirement for self-help leads to the "security dilemma. See, Bruce Russett & Harvey Starr, *World Politics: The Menu for Choice*, W. H. Freeman and Company, New York, Third Edition, 1989 , pp: 60 - 61. See also, Manfred Efinger, "Preventing War in Europe Through Confidence and Security-Building Measures ?" in Volker Rittberger (ed.), *International Regimes in East-West Politics*, Pinter Publishers, London and New York, 1990, p. 120.

[85]As a suggested reading in this topic see, John Herz, "Idealist Internationalism and the Security Dilemma," *World Politics*, No: 2, January 1950, pp: 157 - 180; See also, Robert Jervis, "Cooperation Under the Security Dilemma," *World Politics*, No: 30, January 1978, pp: 167 - 214.

difference in the security and non-security issue-areas is that stakes are higher in the former. Not only is security the most highly valued goal because it is a prerequisite for so many things, but the security area is unforgiving. A fourth difference is that, in security issue-areas, detecting what others are doing, and measuring one's own security are difficult.

b... conditions for forming a security regime

Robert Jervis's conditions in that respect are divided into two sets. The first group relates to broad systemic circumstances, and the second to more narrow variables that directly bear on the security dilemma. Under the heading of broad systemic conditions, Jervis identifies four such conditions that are most essential for the formation and maintenance of a security regime: First, the great powers should prefere a more regulated environment to one in which all states behave individualistically. Second, the actors must believe that the value they place on mutual security and cooperation is shared by other states, as cooperation will not occur if states believe that they are confronted by a defector with strong anti-status quo ambitions. Third, all the major actors must accept the *status quo*.[86] Finally, war and the individualistic pursuit of security must be seen as more costly than cooperative action.[87] Indeed, all these four conditions are replicated, at least in part, in today's world. First of all, half a century ago, mankind's most costly war in terms of lives and treasure lost was concluded, and with the incentives of the two superpowers a more regulated international environment emerged. Secondly, given that nuclear weapons are indiscriminate in their effects, and that their effects are widespread, all of the nuclear weapon states, and most, if not all, of the non-nuclear-weapons states, placed (and still do) a high value on non-dissemination of nuclear

[86]However, even if all major actors would settle for the status quo, security regimes, according to Jervis, cannot form when one or more actors believe that security is best provided for by expansion.
[87]Jervis, ibid., pp: 176 - 178.

weapons. Third, the international arrangements for preventing the spread of nuclear explosive devices, as they now stand, represent a modified but fundamental acceptance of post-Second World War *status quo.* [88] Finally, in today's world, it is a truism that nuclear war is exceptionally costly not only in its effect but also in its preparation.[89]

ii... An Analysis of a Security Regime in Practical Terms

Jervis analyses the Concert of Europe as the best example of a security regime with the belief that such an analysis can provide a complementary perspective to his theoretical discussion.[90] During the Concert of Europe era (1815 - 1823), the great powers behaved in ways that sharply diverged from normal "power politics". They did not seek to maximize their individual power positions, neither did they take advantage of others' temporary weaknesses, and vulnerabilities. They moderated their demands and behavior as they took each other's interest into account in setting their own policies. This is not to deny that each state in the Concert placed primary value on its own security and welfare, and did not care much about others' well-being as an end in itself. What is crucial, however, is that "self-interest" was broader than usual, in that statesmen believed that they would be more secure if the other major powers were also more secure. There was a sense that the fate of the major powers were linked, that Europe would thrive or suffer together. Much of the restraint adopted was dependent on each statesman's belief that if he moderated demands or forebore to take advantage of others' temporary weakness, they would reciprocate. For this system to work, each state had to believe that its current sacrifices would not renege on their implicit commitment when they found

[88]The modification is that, basic nuclear science and technology should be shared with the majority.
[89]Smith, ibid..
[90]A detailed historical discussion about the Concert of Europe taken as a case study in Jervis' work is far from being relevant to the subject matter of this study. Nevertheless, the general implications of Jervis' analysis are thought to be useful in providing hints for the establishment of the theoretical framework of this study.

themselves in tempting positions. This implies the belief that, *conflicts of interest could be limited and contained by shared interests, including the interest in maintaining the regime*. Because cooperation was much greater than usual, diplomatic procedures involved more consultation and openness and less duplicity than usual. The power of these norms (i.e., consultation and openness) is shown in the reaction to their being broken. The Concert was supported by the shared stake that the major powers had in avoiding war. All feared that high levels of conflict would destroy their security, not enhance it.[91]

Although the above mentioned conditions and common interests explain why the Concert was formed, what is more important is that the regime influenced the behavior of the states in ways that made its continuation possible even after the initial conditions had become attenuated. The regime was more than a reflection of causally prior variables; it was a force in its own right, exerting influence through several paths. First, the expectation that the Concert could continue to function helped maintain it through the operation of familiar self-fulfilling dynamics. *If an actor thinks the regime will disintegrate -or thinks that others hold this view- he will be more likely to defect from the cooperative coalition himself. On the other hand, if an actor believes the regime is likely to last, he will be more willing to 'invest' in it (in the sense of accepting larger short-run risks and sacrifices) in the expectation of reaping larger gains in the future.* Important here is the expectation that peace could be maintained. Thus, part of the explanation for the Concert's success was that its health was generally seen as quite good, and that each state stopped being restained in the belief that the system would not last long enough for moderation to be reciprocated. Although, no states were completely satisfied with the Concert, all felt that it was better than the likely alternative arrangements, and placed a high priority on maintaining it.[92]

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[91]Jervis, ibid., pp: 178 - 181.
[92]Jervis, ibid., pp: 181 - 182.

A second way in which the regime perpetuated itself was the greater opposition it was expected to foster against attempts forcibly to change the *status quo.* Under the Concert, the states were discouraged from expansionist moves that would have looked attractive if others were expected to follow individualistic security policies. Thirdly, the regime became an independent factor by developing at least a limited degree of institutionalization. In an age of limited communication and travel, the opportunities for direct conversations among national leaders were rare, formal machinery was lacking, no supra-national secretariat was formed, and all decisions and their implementation remained in the hands of national leaders. But coordination was facilitated, and information and expectations were fairly quickly and effectively shared.[93] The Concert of Europe did not last forever due to several factors. As Jervis reasoned, by controlling the risk of war and not yet becoming institutionalized and developing supra-national loyalties, the Concert may have contained the seeds of its own destruction. Since world politics did not seem so dangerous, pushing harder seemed sensible to individual states. But, seeking individualistic gains raised doubts in others' minds as to whether moderation and reciprocation would last, thus giving all states greater incentives to take a narrower and short-run perspective.

iii... Implications of Jervis' Analysis for Non-Proliferation Regime

From the above discussion which is confined to the distinguished work of Robert Jervis, there arises two important aspects that should be considered in an attempt to approach nuclear proliferation as a problem that threatens international security and stability (and that such a problem can be controlled and ameliorated, if not completely solved, within the context of a well established and effectively operating international security regime). One of these aspects relates to the *perception* of the actors of the nuclear non-proliferation regime (i.e., states parties to

[93]Jervis, ibid., pp: 182 - 184.

the NPT in particular) vis-à-vis the general countenance given to the regime regarding the likelihood of its continuance and effectiveness in the long-run. That is to say, the behavior of several states may strongly determine the fate of the nuclear non-proliferation regime into the next millenium. Such states are said to be those which are highly industrialized and very capable of manufacturing nuclear explosive devices in case the political will exists at governmental levels (e.g., Germany and Japan); and also those states which are less developed but ready to devote a great proportion of its national resources to a project that may end up with a nuclear bomb for the sake of either fostering their national security vis-a-vis a perceived nuclear threat, or improving their military might in their region (e.g., Iran, and some South Asian and South Pacific states which are parties to the NPT).[94] An important factor that may affect the behavior of such states (i.e., whether to defect from the regime or not) is said to largely depend on the strength ("health", as Jervis called) of the regime in detecting and punishing the actors that violate common principles, norms and rules.

This observation gives way to the second aspect that can be drawn from Jervis's analytical discussion: importance of *institutionalization* at supra-national level for the continuance of a regime. Nuclear non-proliferation regime is indeed well enough institutionalized with the IAEA which is in charge of the verification of the basic undertakings of the states that became parties to the NPT. Also, the NPT Review Conferences that are held every five year after the entry into force of the Treaty, under the auspice of the United Nations, have provided a degree of institutionalization. The past experience of the the IAEA on safeguards implementation has become a source of complaints for many states with regard to

[94]Giving the names of a few states in this paragraph does not reflect the judgement of the author, but does however reflect a general consensus of many scholars, scientists and policy-makers, in their writings, about the likely moves of several actors in the international arena with regard to the proliferation problem of nuclear weapons.

its effectiveness in detecting the violating states. Loopholes and shortcomings of the non-proliferation regime emanate from a lot many factors. And the main source of these factors can be singularized by stating the following: *behaviors of the states throughout the process of the formation of the nuclear non-proliferation regime*[95] *have affected the strength and effectiveness of the verification institution (i.e., IAEA).* Therefore, the regime does not seem to be as healthy as its proponents would expect for solving the apparently ever growing nuclear proliferation problem in the post-Cold War era. Therefore, the causes lying behind the behaviors of states that are said to have stirred the effectiveness of the regime in preventing the further spread of nuclear explosive devices need extensive elaboration. And, this is the task of the following Part.

[95]While the creation of the IAEA and safeguards documents, and drafting the NPT.

PART II

EMERGENCE & EVOLUTION OF THE ESSENTIAL ELEMENTS OF THE NUCLEAR NON-PROLIFERATION REGIME

CHAPTER III. EVOLUTION OF NUCLEAR SAFEGUARDS

In the wake of the tragic event caused by the atomic bombs dropped on Hiroshima and Nagasaki on 6 and 9 August 1945, the newly established United Nations Organisation (UN) held its first General Assembly (GA) meeting in London in January 1946.[96] Prior to that first UNGA meeting, another important international gathering had taken place in Washington in November 1945. With the participation of the United States, the United Kingdom and Canada (the three states that possessed the knowledge of using atomic energy, and those that had taken part in the manufacture of the first atomic bomb) issued a joint declaration concerning their future policy on the development of atomic energy. Accordingly, the heads of the three governments jointly noted that the scientific discoveries concerning the atomic energy placed an unprecedented means of destruction at man's disposal. They further pointed out that there was a need for international action to prevent the use of atomic energy for destructive purposes while promoting the peaceful uses of the advances in the scientific knowledge, particularly in the atomic energy field.[97] In the joint declaration, it was also noted that the military exploitation of the atomic energy depended in large part upon the same methods and processes as would be required for industrial uses. This would mean that no clear-cut distinction could be made between the military or civilian purposes, or intentions, of the states that would like to develop atomic energy in the future. In the same joint declaration, the three states proposed that the United Nations should set up a commission to study

[96]In its first meeting, United Nations General Assembly (UNGA) adopted its first Resolution calling for the establishment of an Atomic Energy Commission under the auspices of the United Nations in order to deal with the problems raised by the discovery of atomic energy and other related matters.

[97]"Joint Declaration by the Heads of Government of the United States, the United Kingdom, and Canada, November 15, 1945, "in U.S. Department of State, Historical Office, Bureau of Public Affairs, *Documents on Disarmament 1945-1959*, Pub. No. 7008, 2 vols., Washington D.C., U.S. Government Printing Office, 1960, vol. I., p.1., cited in Lawrence Scheinman, *The International Atomic Energy Agency and World Nuclear Order*, Resources for the Future, Washington D.C., 1987.

the problems related to the present and future use and the development of the atomic energy. Accordingly, the proposed commission was expected to make proposals for the control of atomic energy to ensure its peaceful uses, because it was proposed to extend the exchange of basic scientific information for peaceful purposes.[98]

A... Creation of the United Nations Atomic Energy Commission

Following the joint declaration of Washington, the foreign ministers of the United Kingdom, the Soviet Union, and the United States met in Moscow, in December 1945. It then came out that the Soviets were most concerned with the role of the United Nations Security Council (UNSC) in the maintenance of international peace and security. Therefore, the first General Assembly Resolution, which was adopted on 24 January 1946, recognised the primary responsibility of the UNSC in that respect. Hence, the Resolution gave the Security Council the power to issue directions to the United Nations Atomic Energy Commission (UNAEC) -which would be established by the same Resolution. Regarding the composition and the competence of the UNAEC, the Resolution went on to state that the Commission was to inquire into all phases of the problem of atomic energy, and to make proposals on the specific aspects (that were defined in the Washington Declaration) as the *exchange of information, control to ensure peaceful uses,* and *effective safeguards.* The UN Atomic Energy Commission composed of the members of the UNSC and Canada when the latter was not in the Council first met on 12 June 1946 and became a forum for the presentation of the U.S. initiative for the international control of atomic energy. The work of the Commission members revealed the fundamental differences between the Eastern and the Western Block countries in their approach to the concept of *controlling* the atomic energy. Because of these differences the

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[98]Therefore, the commission was expected to study and then propose an effective safeguards system in order to protect complying states against the violating states.

Commission held the last meeting in July 1949, and the consultations of the Permanent Members of the UNSC and Canada ceased in December 1949.[99] Though short lived, the negotiations in the Commission in the mean time worth studying so as to understand the pace of development of atomic safeguards.

i... Issues Discussed in the UNAEC

Following the trilateral discussions of 1945 among the United States, the United Kingdom and Canada, and then among the United States, the United Kingdom and the Soviet Union, and anticipating the first United Nations Resolution, the U.S. Secretary of State appointed a committee of five to advise on the problem of atomic energy and on the aspects of controls and safeguards.[100] The work of the committee is culminated in what would later be called as the *Acheson-Lilienthal Report*.[101] The Report, in essence, proposed an international authority that would monopolize (i.e., an authority that would own and manage as well as inspect) all dangerous atomic activities, while leaving safe and productive activities open to individual countries and private interests. The Acheson-Lilienthal Report concluded that the ability to produce special nuclear material was a critical step toward nuclear weapons, thus a system of inspection superimposed on an otherwise uncontrolled exploitation of atomic energy by national governments would not be an adequate safeguard, and that international safeguards alone could not therefore assure effective separation of civil and military uses of nuclear energy.

99The issue of which government should be seated as the Government of China in the wake of the communist revolution was one important factor in not furthering the consultations among the big Powers.

100The committee consisted of Dean Acheson, General John McCloy, Professor Vannevar Bush, Professor James B. Conant and General Leslie R. Groves. The committee engaged a board of consultants comprised of C. I. Barnard of the Bell Telephone Company, Robert Oppenheimer who was in large part the creator of nuclear weapons, C. A. Thomas of the Monsanto Chemical Company, H. A. Winne of the General Electric Company, and David Lilienthal, chairman of the Tennessee Valey Authority. For further details see, Allan McKnight, *Atomic Safeguards: A Study in International Verification*, New York, UNITAR, 1971.

101See, *A Report on the International Control of Atomic Energy*, prepared for the Secretary of State's Committee on Atomic Energy, Washington, March 1946. See also, Lawrence Scheinman, *The International Atomic Energy Agency and World Nuclear Order*, p. 17.

a... Baruch Plan

Further proposals of the United States to the UNAEC were presented by Bernard Baruch -the then U.S. representative to the UNAEC- on 14 June 1946. Although Bernard Baruch made substantive modification in the Acheson-Lilienthal Report, he ultimately supported the Report's basic concept of an international agency with broad responsibilities for ownership and management, as well as research and development in the nuclear field. The United States' proposals, or the so-called *Baruch Plan,* consisted of two memoranda dealing, on the one, with the general problems of atomic energy, and, on the other, with its control. Regarding the general issues pertaining to the atomic energy, the Baruch Plan proposed the establishment of an *international atomic development authority* with a treaty. The first memorandum also listed which matters of substance should be included in the treaty of the proposed authority. Accordingly, the Baruch Plan proposed the followings in an extensive format :[102]

1... the provisions that the treaty should contain;

2... the purposes of the authority that the charter should state;

3... the specific provisions governing the functions and powers of the authority that the charter should contain;

4... and the provisions of enforcement that should be included in the treaty.

The second U.S. memorandum set forth the arguments for control that were formulated in the first memorandum, and particularly in favour of the proposed functions and powers of the authority. Since the aim of the treaty was to prevent the destructive uses of atomic energy and to promote the peaceful uses for the

[102]Crucial among the functions and powers of the atomic development authority proposed in the Baruch Plan was the authority's exclusive control or ownership of all uranium, thorium and other material which may be a source of atomic energy wherever present in potentially dangerous quantities, and the authority's right to acquire, construct, own and exclusively operate all facilities for the production of U-235, plutonium and such other fissionable materials.

benefit of the mankind, then the general framework of argument contained the following reasonings:

1... the nuclear chain reaction depends on uranium, and all initial processes in the production of uranium and some subsequent processes are identical whatever the intended uses might be;

2... the core of any control system should thus be an effective dominion over all uranium and its fissionable derivatives;

3... control must attach to uranium from the moment of production and continue as long as there is any danger of destructive uses;

4... the exploitation of atomic energy for peaceful purposes required initial operations identical with those in a weapons programme;

5... the functions of preventing destructive use and promoting peaceful use should be vested in one agency; and

6... such a single agency can be more effective with its positive responsibility to promote, than would be an agency with mere duties of inspection and policing.

The memorandum thus addressed itself to specific functions envisaged for the proposed agency. Therefore, the Baruch Plan suggested the agency should:

1... own all source materials;

2... obtain and maintain complete and accurate information of world supplies of source material;

3... be the sole manufacturer and owner of fissionable material;[103]

4... have complete control as the owner and operator of all facilities which might contribute to weapons production;

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[103]According to Article XX of the Statute of the International Atomic Energy Agency, the term "special fissionable material" means Plutonium-239; uranium-233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing. The term "uranium enriched in the isotopes 235 or 233" means uranium containing the isotopes 235 or 233 or both in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is greater than the ration of the isotope 235 to the isotope 238 occurring in nature.

5... have the right to lease nuclear material for peaceful purposes under proper safeguards;

6... have unhindered access to facilities that use nuclear material;

7... have exclusive rights of research in the field of atomic explosives;

8... not have a right to stockpile atomic weapons.

With a third memorandum, the United States proposed to eliminate the veto power of the permanent members of the Security Council with a view to punish immediately any violation. Hence, the plan proposed that there must be no veto to protect those who violate their solemn agreements not to develop or use atomic energy for destructive purposes.

b... Soviet reaction

The Soviet response to the U.S. proposals came soon in the Commission meetings. The Soviets stressed the need for an immediate international convention for the prohibition of the production and use of atomic weapons, and for the destruction of existing stocks. The response included the Soviet point of view with regard to the system of control. It was proposed to be an elaborate system which would ensure the observance of the convention. The Soviets equally emphasized the need for practical measures that should be adopted for a full and free exchange of scientific information in the atomic field. Though, both the Soviet and U.S. proposals seemed to suggest similar modes of action with respect to the prevention of spread of nuclear weapons while promoting peaceful uses of atomic energy, one important point of disagreement was the insistence of the Soviets to give the ultimate authority to the Security Council with regard to compliance issues. This would mean that the veto power of the permanent members of the UNSC would be active. As to the question of the functions of the proposed international atomic energy authority (which was suggested to be extended to all the national facilities) the Soviets were concerned with the principle of sovereignty. Accordingly, they argued that such a function of an international authority would be incompatible with state sovereignty and that it would mean an unlimited interference in the economic life of the countries on whose territories such controls would be carried out. In essence, the Soviets were unwilling to accept the U.S. insistence on international inspection and on the control of atomic energy to prevent production of atomic weapons. Hence, they asserted that a declaration outlawing these weapons would be sufficient. Despite Soviet opposition and obstruction, the Baruch Plan was discussed for several months in the UNAEC, and reported favourably in the UNAEC's first report submitted to the UNSC by a vote of ten in favour, with the Soviet Union and Poland abstaining.

The subject of control was discussed separately in the Commission, particularly in the Scientific and Technical Committee, consisting of one scientist from each country having a seat in the Commission. A broad exploration of the technically possible methods controlling atomic energy would inevitably lead to the consideration of problems of a non-technical or political nature which would have to be taken into account in a system of control. Therefore, it would be feasible for the Scientific and Technical Committee members to limit themselves to the scientific and technical aspects of the question of control. Though the information at the disposal of the Committee was limited and incomplete which would make a great deal of the conclusions in the Committee's findings hypothetical and conditional, it was equally argued that there was no basis in the available scientific facts for supposing that effective control would not be technologically feasible. The findings of the Committee were presented as some of the elements which should be incorporated in any complete and effective plan. These findings were set out in the UNAEC's first report to the Security Council, dated 31 December 1946 and they were elaborated in UNAEC's second report of 11 September 1947.[104]

ii... UNAEC's First Report to the UN Security Council

a... types of misuse of atomic energy

In their report submitted to the consideration of the Security Council, the members of the UN Atomic Energy Commission put the emphasis on three distinct kinds of misuse of atomic energy. Accordingly, atomic energy would be used for military purposes through *diversion* of nuclear material from declared activities. Secondly, the same result would become possible by means of *clandestine activities* of states. Finally, *unauthorised seizure* of material or plants would result in removing them from the reach of the control agency. To overcome these difficulties the UN Atomic Energy Commission has come up with several suggestions. Regarding the problem of diversion of material from peaceful to military purposes, the report stated that:

1... a single international control agency should be responsible for all safeguards;

2... the safeguards should be flexible enough to be adaptable to rapidly changing technology;

3... the objective of safeguards must be to provide effective control with the least interference in normal activities.

To deal with clandestine activities of states, on the other hand, the Commission assumed that:

1... governments should be required to submit frequent reports on all relevant matters;

[104]At no time were they unanimously accepted because the Soviet Union dissented, but they constituted the foundation for the consideration more than ten years later of the IAEA safeguard system. Allan McKnight, *Atomic Safeguards...*, p. 14.

2... the international authority should co-ordinate all relevant information for the purpose of determining what areas were suspect of harbouring clandestine activities;

3... the authority's privileges of movement and inspection should include rights to conduct by ground and air.

The problem of seizure of materials or plants was recognised as primarily a political question, therefore it was considered only in a preliminary way.[105]

b... safeguards terminology

The United Nations Atomic Energy Commission, in its first report also brought clarity to the meanings of some of the terms used in the safeguards terminology, such as control, inspection, supervision, management, and licensing. Among them, *control* was taken as a general term which included any and all types of safeguards.[106] *Inspection,* on the other hand, meant close independent scrutiny of plant operations which could include observation of points of entrance and exit from the plant and of activities within the plant. *Supervision,* however, meant continuous association in management's day-to-day operation.[107] Whereas *management* meant direct authority over daily operations, *licensing* meant the granting of permission by the international authority to conduct certain activities under specified conditions.

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[105]The main problems needing attention seemed to be the geographical dispersal of plants and of stocks of materials, and the reduction of material inventories and procedures for the emergency destruction of plants and materials before they could be seized.

[106]Types of safeguards were defined as accounting for materials which meant the systematic measurement and reporting in prescribed form of quantities of key materials entering or leaving a plant, or in process or in storage. It would cover specification of the points at which measurements should be taken and the manner of presenting the resulting data in the accounts.

[107]Supervision might require that plants be designed and constructed in a particular manner, or that the inspector have the right to order cessation of operations for the purpose of taking an inventory of materials in process.

c... natural uranium & further steps

As it was the case in the Acheson-Lilienthal report, the utmost importance of natural uranium for further steps in the manufacture of atomic bombs was also stressed in the first report of the UN Atomic Energy Commission. Consequently, the members of the Commission reasoned that mines and ore deposits of uranium would occupy a key place in any control system. Hence, an adequate system of safeguards would be possible provided that the inspectors had *unrestricted access* to all operations and equipment. For uranium enrichment plants, that is isotope separation plants, the Commission pointed out the virtual impossibility of obtaining a material balance regarding the technological level of mid 1940s. Because of the size and complexity of enrichment plants, the great amount of uranium which would be in process at any time made precise inspections difficult. As to reactors and chemical reprocessing plants which serve to extract plutonium from the irradiated fuel, the Commission reasoned the same way as it did for uranium enrichment plants. Taking into consideration that, either in the reactor or in the reprocessing plant there could be in any time significant quantities of plutonium or fissionable uranium U-235, any material diverted could directly go to the production of the bomb. Therefore, the Commission concluded that the management should be in the hands of the international agency. Considering the whole fuel cycle, from uranium mine to the end stages of reprocessing of irradiated nuclear fuel, the Commission suggested that the international agency should check the material content independently with both shipper and receiver in all transfers of nuclear material. The Commission also suggested that the international agency should control storage and shipment of materials, particularly highly enriched uranium and plutonium.

iii... UNAEC's Second Report to the UN Security Council

The second report of UNAEC amplified the first report, but also attempted to meet some of the objections that international control constituted a restriction on the development of atomic energy for peaceful purposes. Thus, the proposed international agency would not be authorised to define the policy to be pursued in the production and use of the atomic energy. The second report also spelled out the limitations on the rights and duties of the inspectors. Accordingly, the second report suggested that:

1... inspections should be conducted only for purposes related to atomic energy;

2... domestic laws and customs in regard to personal privacy and property should be respected to the fullest extent consistent with effective safeguards;

3... confidential and private information acquired in the course of inspection should not be disclosed;

4... and the international agency should pay just compensation for damage caused by its personnel in the course of inspection.[108]

iv... Dissolution of UNAEC

The fundamental and unalterable opposition of the Soviets to the U.S. proposals affected the fate of the second report, too. Hence, the Soviets cast the only negative vote against the second report of the UNAEC. Clearly, by 1948, policy makers in the United States had decided that there was no further basis for negotiations on international control of atomic energy in the UNAEC, primarily because the Soviet Union opposed essential elements of a system of control as supported by the Western and Third World states, and also because the Soviets refused to accept the level of participation in the world community that would be required in the field of atomic energy. According to the U.S. government, fundamental points of disagreement were those that emerged in the immediate aftermath of the presentation of the Baruch Plan, and included ownership of source material; ownership, management and operation of dangerous facilities; research;

[108]See, Allan McKnight, *Atomic Safeguards* ..., pp: 17-18.

elimination of atomic weapons from national armaments; inspection (safeguards); and enforcement (sanctions). Then, the U.S. government recognized an impasse in the UNAEC negotiations and recommended they be suspended. This position was largely reflected in the third and final report of the UNAEC. The third report stated that the Commission has been unable to secure the agreement of the Soviet Union to even those elements considered essential from the technical point of view, and that the Commission has been forced to recognize that such an agreement was itself dependent on cooperation in broader fields of policy. Therefore, the Commission concluded that no useful purpose can be served by carrying on negotiations at the Commission level, and recommended that consultations be continued among the sponsors of the UNGA Resolution establishing the UNAEC.[109]

Despite the failure of the UNAEC to come up with an agreed text for controlling atomic energy, it seems that even at a very early stage of the developments in that field the members of the Atomic Energy Commission have successfully foreseen the difficulties that the succeeding generations would experience in their efforts to prevent the spread of nuclear weapons. This observation should not be surprising, since those who have come up with specific proposals to control the development of atomic energy were those scientists who had taken part in various stages of the development of nuclear energy in their countries that were advanced in the nuclear field. It would therefore be in their knowledge and expertise the 'side-effects' of nuclear energy beyond its peaceful uses in agriculture and medical science, and the ways and means to prevent misuses. Starting with the Acheson-Lilienthal report which prompted the U.S. proposals submitted to the UNAEC meetings by Bernard Baruch, the United States administration in particular committed itself to do its utmost in every international

[109]See, Lawrence Scheinman, *The International Atomic Energy Agency* ... pp. 53-55.

forum to contain further proliferation of nuclear weapons.[110] However, several members of the developing world, as well as the ones from the industrialised world, were not so keen to restrict themselves to making use of the 'benefits' of nuclear energy option. Hence, in the decades that followed the dissolution of the UN Atomic Energy Commission in 1949, the debate about disarmament and the control of atomic energy still continued in the United Nations.

B... Creation of the International Atomic Energy Agency (IAEA)

If one is to mark the period between 1946-1953[111] from the point of view of the United States, *secrecy* and *denial* would well identify the U.S. policy to prevent spread of nuclear technologies and material. The U.S. Atomic Energy Act of 1946 prohibited any peaceful nuclear co-operation of the United States until the U.S. Congress was satisfied that effective safeguards were in place. However, detonation of the first atomic bomb of the Soviet Union in 1949 and that of the United Kingdom in 1952 made it clear that the dissemination of nuclear technology was already underway.[112] The British success with a fission bomb had increased pressure to share more secrets with this ally while it also threatened the U.S. sense of nuclear predominance.[113] Moreover, the United States was concerned that the British might challenge their supremacy in the world nuclear market. The United States consequently revised its nuclear control policy.

[110] Notwithstanding such efforts, some U.S. politicians and private companies were criticized in the public domain in several instances for exporting the material and technology to the developing countries that were allegedly going nuclear (e.g., Israel and Pakistan).

[111] That is the period between the enactment of the U.S. Atomic Energy Act in 1946 and the U.S. President Eisenhower's famous "atoms for peace" speech in the UN General Assembly in December 1953.

[112] The policy of nuclear denial upset a panoply of actors, not the least the wartime allies of the United States, namely France, the United Kingdom and Canada. All three countries had participated the Manhattan Project and considered the denial strategy a breach of the wartime arrangements for nuclear sharing. See, Darryl A. Howlett, *EURATOM and Nuclear Safeguards*, London, The MacMillan Press, 1990. pp: 37-38.

[113] R. L. Beckman, *Nuclear Non-Proliferation. Congress and the Control of Peaceful Nuclear Activities*, Boulder: Colorado, Westview Press, 1985, p. 58.

i... Eisenhower's "Atoms for Peace" Speech

On 8 December 1953, U.S. President Dwight D. Eisenhower addressed the United Nations General Assembly on the subject of atomic energy and proposed the establishment of an international atomic energy agency. In his speech Eisenhower stressed the need for an international effort to use atomic energy for the welfare of humanity. He suggested that peaceful applications of atomic energy could be done if those governments that were principally involved would make contributions from their stockpiles of natural uranium and fissionable materials to an international atomic energy agency. A peaceful purpose, he suggested, was the production of electric power from special fissionable material which necessarily required supplies of natural uranium as well. Subsidiary uses of radioactivity in agriculture, medicine and other fields were also meant to be peaceful uses of atomic energy. In a period marked with Cold War polemics and discussions on destructive potential of nuclear power, Eisenhower's speech was received with tremendous acclaim.[114]

In the environment created by Eisenhower's speech amplified with the enactment of the U.S. Atomic Energy Act of 1954[115], many countries negotiated agreements with the United States in 1955.[116] In the General Assembly meeting of 1954, the United States made it clear that the proposed agency would not interfere with the traditional methods of bilateral trade and scientific co-operation, but would be an additional channel for obtaining assistance for an atomic energy programme. It was also made clear that in the event of an international organisation being set up with a safeguards function, the two states would consult with a view to transferring

[114]However, while the Soviets' attitude was in line with the ideals presented in the atoms for peace speech and that they expressed their willingness to participate in discussions on Eisenhover's proposals, they equally questioned whether the means proposed in the speech would truly realise the ideals presented. Therefore, the Soviets contended that the atoms for peace proposal neither meant to halt the growing production of atomic weapons, nor to restrict the possibility of their use.

[115]Significance of the U.S. Atomic Energy Act of 1954 is that it allowed the United States to enter into bilateral nuclear transfer agreements after a period of secrecy and denial.

[116]The United Kingdom and Canada were also present in the suppliers market of nuclear material, equipment and facilities.

to the organisation the administration of the safeguards obligation.[117] No later than a month after the atoms for peace speech, the United States and the Soviet Union started to exchange views on Eisenhower's proposals. In the mean time, the USAEC and the U.S. Department of State were set on devising an outline of the proposed agency which would embody the vision of Eisenhower. The outline proposed contributions of uranium and fissionable material to be allocated by the agency for peaceful purposes.[118]

ii... Multilateral Discussions on an International Authority

a... eight-nation group meetings

In mid 1954, the United States began discussing the modalities of an international atomic energy agency with a group of states comprising Canada, France and the United Kingdom all of which had advanced nuclear programmes, and South Africa, Belgium, Portugal and Australia which were the producers of uranium.[119] This group of states would soon be called as *eight-nation group*. During 1955, the eight-nation group went on to consider the proposal circulated to the group member states by the United States as a first draft of a statute of the international agency envisaged to control the uses of atomic energy.[120] To further these efforts, the United Nations General Assembly endorsed the holding of an international scientific conference on atomic energy. In August 1955, a conference met in Geneva. The participants discussed the safeguards that would be required for

[117]Bilateral agreement between the United States and a recipient state provided for safeguards over any assistance given by the United States and for their administration by inspectors of the United States Atomic Energy Commission (USAEC).

[118]Hence, the supply of nuclear material received by the agency would be used to encourage world-wide research and development of peaceful uses of atomic energy by assuring that engineers and scientists of the world have sufficient materials to conduct such activities and by fostering interchange of information.

[119]The Soviet Union was notified separately by the United States about these consultations, and these bilateral negotiations proceeded, albeit slowly, along with the discussions in the eight-nation group.

[120]The first draft was discussed in the eight-nation group and the resulting second draft including the changes was submitted to the consideration of the Soviet Union.

peaceful uses of atomic energy undertaken through an international agency. It was concluded that: *physical security complemented by material accounting would be required for the international agency's safeguard system.*[121]

b... twelve-nation group meetings

At the end of the Geneva Conference, the United Nations distributed the second draft of the statute to eighty-four states or specialised agencies of the United Nations with a request for comments from all states. The draft statute was then discussed in the Tenth Session of the General Assembly held in the last quarter of the year. In the mean time, with the addition of Brazil, Czechoslovakia, India and the Soviet Union, the eight-nation group enlarged to *twelve-nation group*. The twelve-nation group was to prepare a draft statute taking into consideration the views expressed in the General Assembly debate. That draft would be submitted to a final conference in the United Nations. The draft produced by twelve-nation group was substantially different from the one prepared by eight-nation group. India and the Soviet Union put their emphasis mostly on the safeguards provisions. It was then decided that: *the obligation of a state to submit to safeguards should not derive from membership in the agency, but from the application for and reception of agency assistance.*[122]

iii... Debate Over Safeguarding Bilateral Agreements

a... the British view

During the so-called private discussions among the nuclear powers, bilateral agreements between the supplier and receiver countries were seen as a problem. The British argued that unless safeguards were applied to bilateral agreements as

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121This was a theoretical conclusion that would later be reflected in the practice of International Atomic Energy Agency's safeguards provisions.

122This would mean that those states with advanced nuclear technologies would be exempted from safeguards application, for it would be hardly likely that these states would apply to the agency for technical assistance.

well as Agency assisted projects, the safeguards system would not work efficiently. If bilateral agreements were to be exempt from control, this would provide countries that needed help with the possibility to go ahead with nuclear research and development while at the same time avoiding control. For the control to be effective, it was, furthermore, necessary that all big supplier countries should agree on control of bilateral agreements. If such an understanding could be established, it would be likely that countries that did not want to be controlled, would still end up by accepting control in order to get assistance.[123]

b... the U.S. and the Soviet views

Before the start of the twelve-nation group discussions in March 1955, the Americans raised the question of control of bilateral agreements suggesting informally that the major nuclear supplier countries might agree to insert safeguards against diversion of fissile materials to military purposes into their bilateral agreements with other countries. It was suggested that this could be agreed outside of the international agency. The Soviets did not want to commit themselves at that stage, but promised to come back to the question once the treaty on the international atomic energy agency would be ratified. However, the question could not be avoided at the twelve-nation group meeting. Already during the discussions at the Tenth session of the UN General Assembly, there had been numerous negative reactions regarding the safeguards contained in the draft that was then discussed. The message to the nuclear powers was that few countries would willingly comply with the strict safeguards attached to receiving agency assistance if the same assistance could be procured through bilateral agreements with no safeguards attached. At the twelve-nation group meeting, a new paragraph was in fact added to the safeguards provisions that made agency controls of bilateral

[123]See, Astrid Forland, "Hope Over Fear: The Establishment of the International Atomic Energy Agency", *Forsvarsstudier*, The Norwegian Institute for Defence Studies, Oslo, 3 /1995, pp: 15 - 16.

agreements possible, by authorising the agency to verify compliance also with bilateral and multilateral arrangements if the parties requested it.

iv... Issues in the Conference on the IAEA Statute; *pros and cons*

The conference on the statute of the proposed international atomic energy agency commenced on 20 September 1956 with the participation of eighty-one states that were then represented in the United Nations. The natural tendency for the twelve-nations and the widespread recognition among the participants was that the draft statute tabled represented the maximum consensus attainable, and thus it was a comprise document. However, there were also objections of a group of states which argued that a compromise was reached beyond their knowledge, therefore the document did not fully satisfy their needs and expectations. Hence, they proposed amendments to the draft statute. But, most of the amendments were relatively uncontroversial. The Conference finally endorsed the Statute[124] and the drafting of the Statute of the international agency ended with its approval on 23 October 1956 at the headquarters of the United Nations in New York. Following the eighteenth ratification[125], the Statute entered into force on 29 July 1957. Thus, the International Atomic Energy Agency (IAEA) formally came into being since then, and the first General Conference of the Agency was opened on 1 October, 1957, in Vienna.[126]

a... disarmament obligation

One of the principal issues of debate in the Conference on the Statute of the IAEA were those related to disarmament obligations of the nuclear "haves" versus

[124] Of some eighty proposals for amendment, about sixty were considered and about thirty were passed. See, Lawrence Scheinman, ibid., p. 71. See also, Allan McKnight, ibid., p, 23.

[125] In order for the Statute to enter into force, three of the required eighteen ratification had to come from among the following states: the United States, the United Kingdom, the Soviet Union, France, or Canada.

[126] The year 1957 also witnessed the first hydrogen bomb test by the United Kingdom, and the launching of Sputnik I by the Soviet Union.

the safeguards undertakings of the "have-nots". These could be considered as 'follow-up debates' on linking the establishment of the Agency to various kinds of disarmament measures. During the initial phases of negotiations Americans had in mind to make the international agency an instrument for the promotion of disarmament by refusing agency assistance to countries that had military nuclear programs. However, Canadians rejected this idea but insisted that such disarmament issues should be handled separately. The British on the other hand, concluded that linking the disarmament issues to the functioning of the agency would not be practical because, they believed, it would not work due to the reason that it would not be accepted by all the countries, particularly by France.[127]

For the sake of reaching a universal agreement, the objectives relating to complete disarmament could not have been made part of the Statute. In their part, the Soviets wanted to make the establishment of the International Atomic Energy Agency dependent upon an agreement on a nuclear test ban.[128] Though these states maintained their pre-Conference views during the Conference on the Statute, ultimately *no linkage* was envisaged in the Statute between the disarmament goal and the functioning of the IAEA.

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[127]The early 1950s also witnessed the effort of the Western European countries to establish their own international organization which would coordinate and control the development of nuclear energy in the frontiers of the six countries that established the European Economic Community (EEC). That organization, namely EURATOM, was central to debates both between the Eastern and Western blocks, and among the Western European countries themselves. In those years France, under the leadership of De Gaulle, was committed to "going nuclear" at all costs, and the French Parliament became an arena of ideological confrontations on whether the country should pursue atomic ambitions or not. Ultimately, the prevailing decision was going nuclear. For an excellent elaboration of these events that led to the emergence and evolution of EURATOM, see, Darryl A. Howlett, *EURATOM and Nuclear Safeguards*,

[128]The Soviets argued that the American proposal for the establishment of the IAEA did not meet with its basic purpose, that is the elimination of the threat of nuclear war. They maintained that helping countries to establish a nuclear power industry would not lead to a reduction of the stocks of nuclear materials that were needed for the manufacture of nuclear bombs, but would, on the contrary, lead to a world-wide increase of fissile material stocks. The Soviets therefore proposed to prohibit the manufacture of nuclear weapons and to establish appropriate international control over this prohibition. Americans found this proposal totally unacceptable. See, Astrid Forland, ibid., p. 13.

b... safeguards on source material

Many states voiced objections about safeguards provisions of the proposed statute. Particularly, India argued that the safeguards provisions of the Agency had to be applicable to all states, and not merely to recipients of assistance. One subject of controversy on safeguards were whether source materials would be safeguarded. The draft statute proposed safeguards over such material, that is natural uranium. In case safeguards were to be applied to source material, Belgium, Australia, Canada and the United Kingdom would be among those states which would be directly affected. The main argument against the application of safeguards to source materials was that natural deposits of uranium were widespread in the world, and that if safeguards attached to uranium supplied by the international agency, many states would be obliged to extract uranium from indigenous ores at a high cost. Therefore, uranium producers would be badly affected financially. The counter argument in support of safeguards over source material rested on the reasoning that a state could construct both a reactor and a reprocessing plant without external assistance, and that the supply of uranium through the international agency would be a cause of applying safeguards to verify non-military use. The proposals that were advanced to amend the draft statute regarding application of safeguards to source material were rejected.

c... safeguards on produced material

A related issue of debate during the Statute Conference was on the provision of the draft statute to apply safeguards to produced material. Since the most likely path to manufacturing an atomic bomb required supply of uranium and a reactor to irradiate that uranium, and chemical reprocessing of the irradiated fuel for the extraction of plutonium (U-239) then all these steps were envisaged to be taken under the scope of safeguards. According to the draft statute, in case the international agency provided any recipient state with either natural uranium or such equipment as reactors or chemical reprocessing plants, then the supply of any of such ingredients would necessitate the application of safeguards to the supplied material and to any subsequent generations of produced material resulting from the use of the initial produced material. Many developing countries objected to safeguards on produced material *per se,* apparently on the ground that these materials were partly the result of their indigenous efforts too. That is, these materials were produced by plants for which the countries carried considerable managerial and financial responsibility. This objection was reinforced by the statutory rights proposed for the international agency to approve the means to be used for chemical reprocessing, and to require deposit with the international agency of any excess of plutonium over what was required for peaceful research and industrial utilisation.[129] On the contrary, the argument in support of the statutory provisions was that access to the free use of a stockpile of plutonium was the last step before fabrication of a weapon, and that if a stockpile resulted from the assistance provided by the international agency, then the use had to be limited to peaceful purposes and verified by the international agency.

d... state sovereignty

Beyond the modalities of application and the nature of international agency safeguards, several other issues were also debated during the Conference on the IAEA Statute. For instance, many states advanced the Soviet argument of 1947 (in the UNAEC meetings) that the safeguards function of the international agency would lead to interference in the varied fields of the life of a state. The sovereignty argument was accompanied by the discrimination argument. Less developed countries contended that the countries with advanced nuclear technologies would

[129]The purpose of the right to require deposit was to prevent the stockpiling in national hands of material suitable for weapons, a purpose clearly stated in the Baruch Plan as desirable in an international system. A further purpose was to avoid the risk of seizure by another state. See, A. McKnight, ibid., p. 34.

not require international agency's assistance in contrast to the growing need of assistance of developing countries for diverse uses of atomic energy. Hence, the countries from the less developed parts of the world would then be obliged to accept international agency safeguards because of accepting that agency's assistance. This would clearly mean discrimination.[130]

e... definition of military activities

Throughout the negotiations there was a recurring debate on whether "military activities" as opposed to "peaceful activities" should be given a definition in the Statute. "Military" and "peaceful" are terms that are used repeatedly in the Statute to designate either the kind of the activities which the international agency-sponsored project should have no relation with, or the kind of the projects that the international agency is to promote. During the negotiating process there seems to have existed a kind of tacit majority view, which ruled that it was best to avoid defining the terms. At the final Conference, the French defied this consensus and submitted an amendment suggesting that "military applications of the atomic explosion and of the toxicity of radioactive products" were the only uses of nuclear energy that should be regarded as military uses.[131] The uncertainty created by the definition of the terms led the IAEA to be very careful about the kind of the projects it would be involved. Therefore, the projects that would be receiving international agency's assistance had to be unambiguously peaceful. It thus meant that the term military would be interpreted as meaning an unambiguously war or defence related activity. Consequently, the main and perhaps the only abuse of Agency assistance that the Agency sought to prevent would be the production of nuclear bombs.[132]

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[130] The discrimination argument was to be high on the agenda of many states in the course of the 1960s and 1970s, as a ground for objection to IAEA safeguards, particularly during and after the negotiations on the Nuclear Non-Proliferation Treaty.

[131] What the French wanted was a confirmation that nuclear propulsion of ships should be regarded as a peaceful activity. See, A. Forland, ibid., p. 15.

[132] Paul Szasz, *The Law and Practices of the International Atomic Energy Agency*, Vienna: IAEA, Legal Series No. 7, 1970, p. 352.

f... discrimination

One of the issues that caused most trouble in the final stages of the negotiation process was the discriminatory aspects of the Statute. The Statute was in fact fundamentally discriminatory in that it was not membership of the Agency that determined a country's relationship with the Agency, but whether the country was at the supplying or receiving end of Agency assistance. The difference in status was expressed through the Articles on safeguards; on composition of the Board of Governors; and on the distribution of power between the Board and the General Conference.

C... Statutory Provisions of the IAEA Relating to Safeguards

The basic authority for the application of International atomic Energy Agency safeguards is its Statute. In so far as safeguards obligations are incurred, the IAEA Statute established a framework for implementation. The Statute comprises twenty-three articles encompassing a lot many issues extending from the objectives and functions of the Agency to its relationship with other organisations and to the provisions for the settlement of disputes. From among these articles and paragraphs and/or sub-paragraphs within the articles, some are directly relevant to application of the Agency safeguards. These articles and the paragraphs are: Article II; Article III, paragraph A, sub-paragraph 5; Article XII, paragraph A, sub-paragraphs 1 thru 7. It is important to note before spelling down the above noted articles and paragraphs that, according to the statutory provisions, states are not obliged to submit to safeguards *unless* they receive Agency assistance; or supplier states request the application of safeguards to bilateral agreements; or the states themselves voluntarily ask for the application of Agency safeguards. That is, though the Agency is legally authorized to engage in and conduct the activities set out in the Statute, this is not a discretionary authority to impose unilaterally the statutory rights of the Agency on the states.

i... Objectives (Article II)

The Agency shall 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 way as to further any military purpose.[133]

ii... Functions (Article III)[134]

A. The Agency is authorised:

5. To establish and administer safeguards designed to ensure that, special fissionable and other materials, services, equipment, facilities and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose; and to apply safeguards, at the request of the parties, to any bilateral or multilateral arrangement, or at the request of a State, to any of that State's activities in the field of atomic energy;[135]

iii... Agency Safeguards (Article XII)

A. With respect to any Agency project, or other arrangement where the Agency is requested by the parties concerned to apply safeguards, the Agency shall have the following rights and responsibilities to the extent relevant to the project or arrangement:

1. To examine the design of specialised equipment and facilities, including nuclear reactors, and to approve it only from the view-point of assuring that it will

[133] The twelve-nation draft statute contained no definition of "military purpose". Two definitions were proposed. The first read: " Any military purpose shall mean the production, testing or use of thermonuclear or radiological weapons." The second stated that "The only uses of atomic energy which shall be regarded as uses for non-peaceful purposes are military applications of the atomic explosion and of the toxicity of radioactive products." Both proposals were withdrawn, and the IAEA statute contains no definition of "military purpose". See, Allan McKnight, ibid., pp: 35 -36.

[134] Article III comprises four paragraphs A, B, C and D, and total of 12 sub-paragraphs.

[135] In paragraph D of the Article III, it was made explicit, in accordance with the provisions of the Statute, that the activities of the Agency would be carried out with due observance of the sovereign rights of the States.

not further any military purpose, that it complies with applicable health and safety standards, and that it will permit effective application of the safeguards provided for in this article;

2. To require the observance of any health and safety measures prescribed by the Agency;

3. To require the maintenance and production of operating records to assist in ensuring accountability for source and special fissionable materials used or produced in the project or arrangement;

4. To call for and receive progress report;

5. To approve the means to be used for the chemical processing of irradiated materials solely to ensure that this chemical processing will not lend itself to diversion of materials for military purposes and will comply with applicable health and safety standards; to require that special fissionable materials recovered or produced as a by-product be used for peaceful purposes under continuing Agency safeguards for research or in reactors, existing or under construction, specified by the member or members concerned; and to require deposit with the Agency of any excess of any special fissionable materials recovered or produced as a by-product over what is needed for the above-stated uses in order to prevent stockpiling of these materials, provided that thereafter at the request of the member of members concerned special fissionable materials so deposited with the Agency shall be returned promptly to the member or members concerned for use under the same provisions as stated above;

6. To send into the territory of the recipient State or States inspectors, designated by the Agency after consultations with the State or States concerned, who shall have *access at all times to all places* [136] and data and to any person who by

[136] It is often noted that stringency of EURATOM's safeguards provisions stems from a similar clause in the EURATOM Treaty which authoizes the EURATOM inspectors to have access *at all times to all places* within the frontiers of the member countries. It is however worthy of noting that, in contrast to the statutory limitations on the IAEA concerning unlimited access, the EURATOM member states are bound to accept EURATOM inspectors at all times to all places in

reason of his occupation deals with materials, equipment, and facilities which are required by this Statute to be safeguarded, as necessary to account for source and special fissionable materials supplied and fissionable products and to determine whether there is compliance with the undertaking against use in furtherance of any military purpose .... with the health and safety measures .... and with any other conditions prescribed in the agreement between the Agency and the State or States concerned. Inspectors designated by the Agency shall be accompanied by representatives of the authorities of the State concerned, if that State so requests, provided that inspectors shall not thereby be delayed or otherwise impeded in the exercise of their functions;

7. In the event of non-compliance and failure by the recipient State or States to take requested corrective steps within a reasonable time, to suspend or terminate assistance and withdraw any materials and equipment made available by the Agency or a member in furtherance of the project.

The actual application of safeguards is conducted on the basis of safeguards agreements negotiated between the Agency and the safeguarded state, within the framework of the Statute and the Agency safeguards documents that have been developed by the IAEA members and the Secretariat and approved by the Board of Governors and confirmed by the General Conference. These documents have put the basic concepts of the Statute into operational form and have in some cases narrowed the Agency's authority, although always consistent with the principle of ensuring that the Agency can carry out its safeguards responsibilities.

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order to carry out their inspections. On the other hand, as Lawrence Scheinman observed, the apparently sweeping authority of the IAEA to have "access at all times" itself was limited in the Statute. This authority is tied to data, places, and persons related to safeguarded material, equipment, or facilities and does not constitute a right for inspectors to roam freely in the territory of the safeguarded state. L. Scheinman, ibid., p. 126.

D... Organizational Structure of the IAEA

The IAEA is a member of the general United Nations system of organizations, and is requested to report to various UN organs (e.g., reporting to the UN Security Council in cases of non-compliance). But, with its 122 member states, is an independent agency, and it doesn't receive directions from any of the UN organs. The Agency consists of three principal organs, namely the Board of Governors, the General Conference, and the Secretariat headed by the Director General.

i... The Board of Governors

Of the three organs of the IAEA, the Board of Governors acts as the executive organ, therefore it is the most important for the operation of the Agency. The Board has a very strong position relative to the General Conference, and it has played a key role in the development of the safeguards system. During the Conference on the Statute of the IAEA there were several arguments and counterarguments concerning the composition of the IAEA Board of Governors. The discussions in this regard revealed the differences between the nuclear *haves* and *have-nots* over representation on the Board, and the relationship between the Board and the General Conference. Developing countries seeked for wider representation in the Board, and minimum contribution to financing the Agency. These countries were not satisfied with the American outline of the direction of the Agency. Throughout the negotiating process the original American idea of a relatively small and powerful board was gradually modified into a bigger organ losing power to the General Conference, where all members had a seat. Thus at the twelve-nation group meetings, the composition of the Board was expanded from 16 to 23, and geographic distribution was emphasized at the expense of competence, and currently the Board of Governors consists of 35 member states.[137]

[137]The 39th Regular Session of the IAEA's General Conference was held in Vienna from 18 to 23 September 1995. It was attended by 103 member states which elected eleven new members of the Board of Governors for a two-year term. The new members are, Bulgaria, Chile, Denmark,

Furthermore, the exercise of some of the functions of the Board of Governors was made subject to rules approved by the General Conference, thus increasing the influence of the Conference over the Board.[138] By the terms of the Statute it was agreed that the Board of Governors would comprise of the countries that were most advanced in the technology of atomic energy as well as countries that were producers of the uranium ore.[139] Among the legislative powers of the Board of Governors are the decisions on membership applications to the Agency, the Agency budget, and the programs and projects to be assisted by the Agency. The Board also approves all safeguards arrangements between the states and the Agency, as well as the safety standards in the nuclear installations. The responsibility to appoint the Director General rests on the Board of Governors. The Board operates by majority vote, with no veto.

ii... The General Conference

The General Conference can be viewed as analogous to the General Assembly of the United Nations. The Member States to the IAEA are represented in the General Conference, and discuss the general issues relating to the Agency programs and the annual reports of the Director General, the Agency budget for the forthcoming year, applications for new membership in the agency, and to elect the members of the Board of Governors. The General Conference meets only once a year generally in Vienna. On several occasions, in response to invitations from

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Egypt, Rep. of Korea, Kuwait, the Netherland, Nicaragua, Nigeria, Romania, and Saudi Arabia. The other twenty-four members of the Board which have either been designated by the General Conference in 1994 are: Algeria, Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Ghana, India, Japan, Mexico, Morocco, Pakistan, Russia, Slovak Rep., South Africa, Spain, Thailand, Turkey, the United Kingdom, the United States, and Uruguay. See the IAEA document, GC(39)/28, 20/9.

138 Paul Szasz, *The Law and Practices of the International Atomic Energy Agency*, pp: 40-41.

139 As Lawrence Scheinman observed, the method of choosing the Governors was considered with particular care during the Statute Conference. The formula that was finally agreed upon balanced the geographic considerations with the capacity of the cooperating nations to supply technical or material support to Agency projects.

member governments the annual meetings can be convened elsewhere.[140] The General Conference has the authority on matters referred to it by the Board or "to propose matters for consideration by the Board and to request from the Board reports on any matters relating to the functions of the Agency".[141] The true value of the General Conference lies not in its limited formal powers, but in its role as a forum where those not represented on the Board of Governors can express their views and exchange information, and where Member States can finalize bilateral/multilateral agreements in the nuclear field.[142]

<u>iii... The Secretariat</u>

The Secretariat is the operating organ of the IAEA and is headed by the Director General who is appointed by the Board of Governors, and approved by the General Conference, for a four-year term that can be extended.[143] Five Deputy Directors assist the Director General in the Administration, Technical Cooperation, Nuclear Energy and Safety, Research and Isotopes, and the Safeguards Departments.[144] Two advisory bodies, namely the Scientific Advisory Committee (SAC) and the Standing Advisory Group on Safeguards Implementation (SAGSI), make recommendations to the Director General on technical matters. The members of SAGSI, although not formally government representatives, are appointed in

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[140]The General Conference has been held in Tokyo in 1965, in Mexico city in 1972, in Rio de Janeiro in 1976, and in New Delhi in 1979. The meetings are usually held in September every year and last for a week.
[141]Statute of the IAEA, Article V. F.2.
[142]Lawrence Scheinman, *The IAEA and World Nuclear Order*, ... p. 83.
[143]The first Director-General of the IAEA was the U.S. Congressman W. Sterling Cole. At the end of Cole's four-year term, the Swedish nuclear scientist Sigvar Eklund took over the office and served for more than two decades (1961-1982). Since then, the third and the present Director General of the IAEA is again a Swedish, but this time a diplomat, Dr. Hans Blix. In September 1993, Dr. Blix has been reappointed to this fourth four-year term in the office.
[144]L. Scheinman noted (in 1987) that ever since the departure of Sterling Cole in 1961, the deputy director general for administration (who has staffing, external relations, and a general oversight responsibility) has been an American. The technical cooperation post, established in 1964, has been filled by a national from the Third World; research and isotopes by a national from Organization for Economic Cooperation and Development (OECD) nation; nuclear energy and safety, by a Soviet national; and the safeguards post has been occupied by an Australian, two Swiss, and a German.

consultation with the governments of their states. While this committee serves as a source of technical advice to the Director General, it is argued that its usefulness has been hindered by the inevitable government connection.[145]

[145]See, David Fischer and Paul Szasz, *Safeguarding the Atom: A Critical Appraisal*, London: Taylor and Francis, 1985, p.67.

CHAPTER IV. EVOLUTION OF THE IAEA SAFEGUARDS DOCUMENTS

A... Overview

Among the principal activities of the IAEA, enlarging "the contribution of atomic energy to peace, health and prosperity throughout the world" constitutes an important proportion[146]. However, it is the Agency's prime responsibility of applying safeguards to the nuclear activities of the states that makes it really significant with regard to its role in international politics. The concept of safeguards itself changed substantially between the post-Second World War period and the U.S. President Eisenhower's famous "Atoms for Peace" speech at the United Nations in 8 December 1953. Initially, the atomic safeguards were conceived as an integral part of a system of international ownership, management and control of sensitive nuclear facilities.[147] However, present day nuclear safeguards are based on a fundamentally different approach that was developed as a result of the change in the United States policy on nuclear cooperation which was reflected philosophically in the Atoms for Peace speech, and practically in the revision in 1954 of the U.S. Atomic Energy Act of 1946 to permit international nuclear cooperation. *The new approach abandoned the earlier notion of an international monopoly in favour of a system of international verification of obligations accepted by states with respect to nationally owned and controlled nuclear activities.* An important underlying assumption of the new approach is that it is possible to achieve a separation between peaceful and military nuclear activities if appropriate assurances, in the form of national undertakings and pledges, are established and maintained -and, of course, if such assurances are subject to an effective verification system based on international safeguards including inspection. Hence, in this framework safeguards are not an arm of a supranational authority as

[146]IAEA Statute, Article II.

[147]The Baruch plan of mid-1940s, had proposed direct control of the nuclear material that were essential for the manufacture of nuclear explosives.

they would have been if the Baruch plan and the UNAEC's reports had been materialised.

Safeguards may be comprehensive or limited to specific materials and facilities depending upon the scope of the underlying commitments to which they apply. *Safeguards are not intended to seek out clandestine operations or undeclared activities or to govern or regulate national action. Their function is to monitor, audit and report, and to verify that states are in compliance with their voluntary undertakings not to use nuclear materials and facilities under safeguards for military purposes.* They are not intended to prevent national accumulation of safeguarded weapon-usable material. Safeguards are important because many of the institutions and instrumentalities that collectively constitute the nuclear non-proliferation regime rely on their effects. The Non-Proliferation Treaty (NPT), The Nuclear Supplier Guidelines (NSG), and the nuclear cooperation policies of the principal nuclear suppliers are dependent on effective international safeguards for their own utility in supporting nuclear non-proliferation and international cooperation and trade in nuclear materials and technology. Thus, *safeguards have become the crux of an effective international nuclear regime.* However, safeguards need the reciprocal support of other non-proliferation institutions and intrumentalities.[148]

Soon after the establishment of the International Atomic Energy Agency, the Board of Governors faced the problem of applying safeguards when Japan asked the Agency for three tons of natural uranium, in October 1956, for a small size research reactor that was under construction. Hence, pursuant to Article XI of the IAEA Statute, an agreement between the Agency and Japan had to be signed in

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[148]Changing circumstances and conditions arising from developments in the nuclear field or from the international environment may give rise to still other mechanisms or institutions to complement and reinforce safeguards in the future. See, in these regards, Lawrence Scheinman, ibid., pp: 121 - 123.

order to make sure that the natural uranium supplied to Japan would not be used for military purposes.[149] The Japanese request for Agency assistance accentuated two important aspects of safeguards implementation. The first aspect was that general regulations for safeguards were needed in preference to a series of *ad hoc* approaches. And, the second was that, the *ad hoc* approach to the Japanese agreement would cover only the initial stage and would need further specifications at subsequent stages. It was also anticipated that in the decades to come, much larger national atomic energy programs of many developing and industrialized countries would involve a lot many such activities. Hence, the Board of Governors could then be called upon to make hundreds of such *ad hoc* decisions on relevant safeguards. Thus, the IAEA Director General Sterling Cole proposed, in June 1959, a set of general safeguards regulations and presented to the consideration of the Board of Governors.

B... The First IAEA Safeguards Document: INFCIRC/26

The IAEA Board of Governors discussed at length the proposals presented by the Director General, and referred to a drafting committee. The resulting draft was further discussed by the Board. After the final alterations by a group of experts, the Board adopted the draft document. Following the confirmation by the General Conference after lengthy discussions,[150] the Board again took up the subject in

[149] A draft agreement was placed before the Board in January 1959 and discussed over several days. In addition to the undertaking against military use, Japan also agreed not to transfer the safeguarded material outside Japan. These two obligations extended to both the uranium supplied and to any special fissionable material (in this case, plutonium) produced by its use. The safeguards clause provided that (1) the safeguards provided for in Article XII.A of the Statute were relevant and (2)Subject to any relevant general regulations that may be adopted by the Board the details of the application of Agency safeguards shall be determined from time to time by the Board after consultation by the Director General with Japan. See McKnight, ibid., p. 46.

[150] Both Allan McKnight and Lawrence Scheinman note that the lengthy discussions both in the Board of Governors and the General Conference were of *political* rather than *technical* in character. Allan McKnight further notes that, some countries even though they had voted for the safeguards provisions of the IAEA Statute maintained in the Board the political objections which they had advanced in the Statute Conference. Ibid., p. 48. Lawrence Scheinman remarks that the first IAEA Safeguards Document INFCIRC/26 was negotiated at a time when the political environment in the Agency still put a strain on constructive cooperation in the field of safeguards. India, supported by the Soviet Union, had sought to impede progress in implementing safeguards,

January 1961 and adopted the Agency's first safeguards document, namely the INFCIRC/26.[151] During the course of discussions both in the Board and in the General Conference, several issues attracted much attention of the member states, and were hotly debated.

i... Debate Over Safeguards Method

The question of whether applying general safeguards provisions to bilateral agreements between the Agency and the states seeking assistance, or considering each application separately (i.e., case by case approach) was one particular issue of concern. Those who preferred case by case approach were concerned with the lack of knowledge and experience on safeguards, both in the Agency and in national administrations. On the other hand, those who favoured the adoption of general rules argued that it was impossible for the Agency to know the general state of development in each member states. They then advanced the following arguments in favour of general principles and against the case by case method:[152]

1... states contemplating requests for the assistance of the Agency in a nuclear project would want to know in advance what the safeguards would be;[153]

2... states desiring to request the Agency to apply safeguards to multilateral or bilateral arrangements would want to know in advance what the safeguards would be;

3... two regional organizations in Western Europe were considering schemes for the application of safeguards.[154] The IAEA, by adopting general rules, would thus set the standards and prevent divergence among the various safeguards systems.

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viewing them fundamentally discriminating against developing nations. Ibid., p 128. Similar views regarding the same matter were expressed by Darryl Howlett of the University of Southampton to the author during an interview.

151 INFCIRC/26 was designed to apply only to reactors of less than 100 megawatts (thermal).

152 See, A. McKnight, ibid., pp: 49 -50.

153 The adoption of general rules was therefore a pre-requisite to the Agency's supply function.

154 The two organizations were ENEA (the nuclear branch of OECD), and EURATOM.

4... the establishment of rules for IAEA safeguards would encourage disarmament negotiators by demonstrating to them the possibility of framing rules for verification of sensitive national activities.

ii... General Rules For Inspectors

The IAEA Board of Governors also considered a set of general rules regarding the Agency inspectors. It was however clear that the rules would not operate unless they would be incorporated into a legal agreement between the state and the Agency. Those who opposed the adoption of general rules argued that the Agreement on the Privileges and Immunities of the IAEA which had been adopted by the Board in October 1959 would suffice.[155] On the contrary, those who favoured general rules argued that the Agreement in mention lacked some essential provisions, such as rules to govern the designation of inspectors. In the result of lengthy discussions, the Board decided that the Inspector General and all officers of professional grade in the Division of Inspection would be appointed by the Director General as staff officials of the Agency, after the Director General had submitted applications recommended by him to the Board for approval.[156]

C... The Second IAEA Safeguards Document: INFCIRC/66

The Indian nuclear development program that included the installation of two large power reactors that were planned to be bought from the United States and Canada, revealed the limitations of the INFCIRC/26. Because, the U.S. domestic nuclear regulations required that a bilateral agreement be signed with India

[155]The Agreement on the Privileges and Immunities applies to the Agency itself as a corporate juridical personality; to the representatives of member states to the Agency; and to the staff officials and experts on missions for the Agency. The Agreement was designated to cover all IAEA staff while engaged on official duties, but it contains some special provisions regarding inspectors.

[156]A few years later, in 1964, the Board decided, on the recommendation of the Director General, to amalgamate the Divisions of Safeguards and Inspection into a single division, and the Inspector General was appointed as departmental head assisted by a Divisional Director. See, McKnight, ibid., pp: 51- 52.

providing for the application of safeguards. Moreover, the U.S. nuclear policy of the period was endorsing the transfer of the administration of such bilateral safeguards agreements to the IAEA. The clear aim was to promote the IAEA. In the early 1960s, there were also several other countries, particularly Japan, seeking for large nuclear power reactors. It then became quite obvious that the scope of the INFCIRC/26 would not meet such requests. Hence, in February 1963 the representative of the United States in the Board of Governors proposed that the scope of the existing document be expanded to cover the large power reactors. Discussions took place in the Board upon the draft prepared in that regard by the Director General, and the expansion was adopted by the Board.[157] It was equally decided to review the existing safeguards document. The committee of the whole Board to review the Safeguards Document met in April-May and October 1964 and in January 1965. During the total of thirty-two meetings the technical content in the discussions was high. When the Board came to consider the proposed new document in February 1965, the arguments like 'discrimination' and 'lack of universality' were again raised by some Governors, particularly by the Indian Governor. It was furthermore argued that there should be no safeguards on equipment components for nuclear plants. This argument was met by providing for safeguards only where a facility was substantially supplied by the Agency rather than merely substantially assisted by it. A working group within the Board attempted to draw up a list of items of the equipment which would justify the supplying authority, whether the IAEA or a state, in requiring safeguards over the equipment, the facility which incorporated it and the nuclear material passing through it.[158] But agreement could not be reached on the adoption of the list. In the result, the Board provisionally adopted a new safeguards document by a vote of twenty-one in favour, none against and two

[157] Following the decision of the Board, the General Conference confirmed the extension with 57 votes in favour, four against and six abstentions. McKnight, ibid., p. 55.

[158] The items listed were substantial prerequisites to the construction of reactors and included only such items as pressure vessels for American type power stations, and on load refuelling machines for British and Canadian type power stations.

abstentions. In September 1965 the General Conference unanimously endorsed the decision of the Board. The new document of 1965, namely the INFCIRC/66 was more direct and comprehensible when compared to INFCIRC/26 of 1961. It was constructed so as to be applicable to bilateral agreements as well as IAEA projects, and its provisions could be readily incorporated by reference in bilateral agreements between states.[159] The Safeguards Document of 1965 is reviewed twice in 1966 and 1968, and its scope is extended to include the reprocessing plants and the conversion/fabrication plants.

i... Inclusion of Reprocessing Plants

The reprocessing plants had always been regarded as the crucial plants in the nuclear fuel cycle, because in them the plutonium is separated from the used fuel and is in its most accessible form for ready diversion and instant use in a weapon program. Accordingly, the Board decided that the application of safeguards should commence of the procedures for reprocessing plants. In paragraph 7 of INFCIRC/66 it is said that "provisions relating to types of principal nuclear facilities, other than reactors, which may produce, process or use safeguarded material will be developed as necessary".[160]

ii... Inclusion of Conversion & Fabrication Plants

In February 1967, the United States proposed to extend the safeguard system by drawing up special procedures for conversion and fabrication plants. In June, the Board decided to proceed again by means of a working group. A Secretariat draft was discussed by the group and an amended version was adopted by the Board in

[159]According to Allan McKnight, INFCIRC/66 was more acceptable politically than its predecessor.

[160]In February 1966, the Board decided to set up a working group with participants of the whole member states to frame such procedures. The Secretariat prepared the draft, which the working group discussed and amended, and the Board adopted, as annex I to INFCIRC/66, some special procedures for reprocessing plants.

June 1968. The definitions of the conversion and the fabrication plants adopted by the Board were: "conversion plant means a facility (excepting a mine or ore-processing plant) to improve unirradiated nuclear material that has been separated from fission products, by changing its chemical or physical form so as to facilitate further use or processing. The term conversion plant includes the facility's storage and analytical sections. The term does not include a plant intended for separating the isotopes of a nuclear material. Fabrication plant means a plant to manufacture fuel elements or other components containing nuclear material and includes the plant's storage and analytical sections." With the two extensions of the scope of the safeguards, all plants in the nuclear fuel cycle were then covered except for enrichment plants, which are referred to in the INFCIRC/66 (Rev. 2) as plants for separating the isotopes of a nuclear material.

iii... An Analysis of INFCIRC/66

The revised and extended IAEA safeguards system as described in INFCIRC/66/Rev.2 is the basis for safeguards agreements concluded since then, except those concluded with states party to the Non-Proliferation Treaty or to the Treaty of Tlatelolco. The INFCIRC/66 consists of a basic document and two annexes that extend its provisions to reprocessing plants, and fuel fabrication and conversion facilities. It has no provisions for enrichment or heavy water production facilities although in 1967 the Soviet Union recommended that procedures be drawn up for uranium enrichment plants. *The INFCIRC/66 safeguards agreements are based on the concept of applying IAEA safeguards to nuclear material or items listed in an inventory.* Usually this inventory lists only materials and items imported from a supplier state; nuclear material which has been produced, processed or used in any of the listed facilities; or equipment and non nuclear material which have been designed, constructed or operated on the basis of relevant technological information provided by the supplier state. The safeguards document INFCIRC/66 consists of four parts.

a... general considerations

General considerations cover the purpose and the general principles of the safeguards document and the IAEA safeguards system. It must be noted that INFCIRC/66 only gives general guidance for the safeguards agreements to be concluded. There may be significant differences between individual agreements and the text of the INFCIRC/66. In order to determine the IAEA's rights and obligations under such agreements, it may be necessary to examine each case individually. In other words, *INFCIRC/66 is an instrument designed to establish a system of technical principles and procedures to permit the IAEA to comply its statutory obligation to ensure that assistance or activities under its supervision or control are not used to further any military purpose.* The INFCIRC/66 thus establishes only a loose technical framework, and serves as a statement of what is minimally acceptable by the states. Because during the negotiations, some states were unwilling to accept comprehensive safeguards, the concluding safeguards document is not full-scope in implementation.

b... circumstances requiring safeguard

Under INFCIRC/66 type safeguards agreements, nuclear materials and facilities in which such materials are used, processed, stored or contained are subject to application of safeguards. The facilities included are reactors for research and power production, spent fuel reprocessing plants, fuel fabrication and conversion facilities, and storage sites. The INFCIRC/66 largely resolved an issue that was debated extensively in the early years of the Agency. That issue was whether only nuclear materials or facilities as well would be subject to safeguards. Principal suppliers of equipment favoured applying safeguards to any assistance that could end up contributing to the production of fissionable material. But, developing countries that were dependent on equipment supply, and industrial states that eventually would be in a position to manufacture their own equipment favoured restricting safeguards to the supply of nuclear material. In the end, it was agreed that *it was primarily nuclear material that would be subject to safeguards, but that facilities could be submitted to safeguards.* Likewise, safeguards could be invoked even with respect to indigenous nuclear material if the latter were produced, processed, or used in a nuclear facility that had been "substantially supplied" to the recipient.[161] In other words, while it was essentially nuclear material that was subject to safeguards, the supply of certain equipment, facilities, or non-nuclear material could invoke Agency safeguards. Safeguards do not extend to uranium or thorium mines or mills, as these are considered ores and therefore are excluded from the definition of "source materials" in the IAEA Statute. However, nuclear material "produced by the use of safeguarded nuclear material" is subject to safeguards.[162] The obligation underlying INFCIRC/66 does not entail a commitment by the state to place all of its nuclear activities under safeguards, but the commitment encompasses only those activities that have been submitted to safeguards.[163]

c... safeguards procedures

The actual safeguards procedures of INFCIRC/66 are similar to those of its predecessor, INFCIRC/26. These procedures include design reviews, records, reports, and inspection, all of which are specified in Article XII of the IAEA Statute. Record-keeping provide a basis for reports submitted to the Agency. *Records* are

[161] The concept of "substantial supply" was central to the resolution of this question of the conditions under which safeguards would be brought into play. The first safeguards document had provided that IAEA safeguards would attach to "specialized equipment and non-nuclear material supplied by the Agency which in the opinion of the Board could substantially assist a principal nuclear facility." (INFCIRC/26, "The Agency's Safeguards", paragraph 37.) This provision was offensive to a number of countries , and was one of the key targets of the review to which INFCIRC/26 had been submitted. Seeing that it would not be feasible to limit safeguards to transferred source and special fissionable material, India urged substituting the notion of "substantial supply" for that of "substantially assisted." The rationale was that, at least this would eliminate the triggering of Agency safeguards merely as a consequence of providing know-how, financial assistance, design drawings or similar aids, and therefore it would avoid intensifying what developing nations perceived as discriminatory arrangements in the first place. See, L. Scheinman, ibid., pp: 132 - 133.

[162] INFCIRC/66/Rev.2, paragraph 19e.

[163] It assumes the possibility that some nuclear material may be located in the safeguarded state that is not subject to IAEA safeguards, and contains provisions allowing for exemption and suspension of safeguards as well as for substitution of unsafeguarded for safeguarded nuclear materials under carefully specified conditions. Ibid., p. 133.

important since auditing and accounting procedures form the basis for international safeguards. According to Article XII.A.1 of its Statute, the Agency examines the *designs* of facilities and approves them to ensure that they will not serve any military purpose and that they will permit effective application of safeguards. *Inspection* is the most essential of the safeguards procedures in the sense that it is the means by which the credibility of the other elements can be established. It is also the most contentious because it is the most intrusive from the sovereignty perspective.[164]

d... sensitivity to sovereignty

An important feature of international safeguards is that they are developed and evolved with particular sensitivity to state sovereignty. The IAEA Statute itself limits the Agency's right to exercise safeguards "to the extent relevant to the project or arrangement" in question. And those arrangements are to be based on a safeguards agreement negotiated between the Agency and the state. Paragraph 4 of INFCIRC/66 reaffirms that the safeguards provisions elaborated in that document come into force only with a safeguards agreement. The same point is reiterated in paragraph 15 of the same document.[165] Although INFCIRC/66 provides that the principles and the procedures set forth are subject to "periodic review in the light of the further experience gained by the Agency as well as of technological developments,"[166] the safeguards document has never been reviewed. The reasons for this are largely political. The risk was that, opening up the document to review

[164]Even among the supporters of international safeguards, L. Scheinman notes, many of them are inclined toward minimalism when it comes to formulating specific inspection arrangements. Ibid., p. 135.

[165]Numerous other provisions in the safeguards document emphasize obligations of the IAEA to states with whom it negotiates safeguards agreements. The Agency is admonished: to implement safeguards in a manner designed to avoid hampering the economic or technological development of the state under safeguards (INFCIRC/66, paragraph 9); to implement safeguards in a manner designed to be consistent with prudent management practices (INFCIRC/66, paragraph 10); to take every precaution to protect commercial and industrial secrets (INFCIRC/66, paragraph 13); and to ensure that no commercial or industrial secret or any other confidential information acquired by reason of safeguards implementation be disclosed except under designated circumstances and to designated individuals (INFCIRC/66, paragraph 14).

[166]INFCIRC/66, paragraph 8.

could lead to the emergence of a weaker, rather than a stronger instrument. Moreover, INFCIRC/66 was negotiated when optimal political conditions existed in mid-1960s for establishing an international safeguards system.[167]

iv... Remarks on the Safeguards Document INFCIRC/66

INFCIRC/66 has certain inherent weaknesses and is, by its nature, subject to some important limitations. INFCIRC/66 remains a framework, and a set of principles, but not a model for an agreement. In this respect it is different from the NPT safeguards document INFCIRC/153. *The limitations to which INFCIRC/66 is subject derive not from the document itself but from external considerations. The fundamental problem is that the obligations that it covers constitute only partial non-proliferation measures. States that accept safeguards under this document do accept (and did in the past) only limited undertakings, agreeing only not to use certain specified items for military purposes. They have not agreed to place all of their nuclear activities under international safeguards. Neither have they accepted the non-proliferation commitment associated with the NPT, as have parties to that treaty.* Under the INFCIRC/66, states do not pledge not to acquire nuclear weapons or explosives, and they remain legally and politically free to develop nuclear weapons or nuclear explosive devices from material, technology, and equipment that is not subject to international safeguards.[168] As a result of the decisions taken by the Board of Governors, or by the efforts of the Secretariat to incorporate new provisions into the safeguards agreements, the following changes occurred in the IAEA safeguards procedures.

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167 However, by the time experience in implementing the document had been gained, the Non-Proliferation Treaty had come into force, and divisions had appeared among the Agency's membership according to whether or not the member was party to the NPT and had accepted non-proliferation undertakings and thus full-scope safeguards. Agency priorities, in the view of some states, became warped, and political confrontations over priorities, values, and resource allocation sharpened. These conditions were not conducive to achieving consensus on a strengthened document that would appear like a more comprehensive safeguards document that would implement the Agency's responsibilities under the NPT.

168 According to L. Scheinman, what the INFCIRC/66 was designed to do, it does well. The difficulties lie beyond the scope of the document's competence or authority.

a... termination & continuation of safeguards

Upon the pressure of a number of Board members, the Director-General proposed in 1973 new rules regarding the duration and termination of safeguards agreements that were negotiated under the INFCIRC/66.[169] Originally INFCIRC/66 made no explicit provision for dealing with nuclear materials after the expiration of a safeguards agreement. Concerning the continuation of safeguards on special fissionable material produced as a result of use of the safeguarded material, paragraph 16 of the safeguards document mentioned of the "desirability" of providing for continuation of safeguards. The likelihood of production of subsequent generations of special fissionable material after the termination of safeguards were of particular concern to the Board members. Hence, since 1974 the duration of safeguards agreements has been tied to actual use in the recipient state of materials or items supplied by the Agency, or by another state requiring safeguards application. By this manner, safeguards continue on subsequent generations of produced nuclear material that is derived from originally safeguarded material or facilities until terminated in accordance with the termination provisions of the safeguards document.

b...interpretation of military purpose

Another improvement in the safeguards procedures was an initiative taken by the Secretariat, and supported by the Board of Governors, in 1974, to redefine the undertaking of the safeguarded state. Until that time, states agreed not to use nuclear assistance to further any military purpose. Beginning in 1972, the United States and the United Kingdom declared that in their view "any military purpose" embraced any nuclear explosive devices and that their nuclear supply was predicated on the recipients undertaking not to use supplied items for such a

[169]More comprehensive and enduring provisions of the Non-Proliferation Treaty that was negotiated throughout the 1960s and became effective as of early 1970s might have stimulated some members of the Board of Governors.

purpose. In 1974, the Director General proposed, and the Board of Governors accepted, an interpretation of "any military purpose" as including any nuclear explosive device. Since 1975, Board approval of safeguards agreements negotiated on the basis of INFCIRC/66 has been contingent upon inclusion of an undertaking by the recipient that none of the supplied items covered by agreement shall be used "for the manufacture of any nuclear weapon or to further any other military purpose or for the manufacture of any other nuclear explosive device."[170]

c... transfer of information or equipment

Moreover, since the mid-1970s, safeguards agreements have included an undertaking by the recipient to accept safeguards on transferred technological information as well as on any nuclear facilities or equipment constructed or operated, or nuclear material produced, on the basis of such information. Furthermore, certain non-nuclear materials such as heavy water and graphite, although not specified in the safeguards document, have come to be treated in much the same way as nuclear material, and are now both subject to safeguards and capable of triggering safeguards on nuclear materials and facilities with which they are associated. Similarly, heavy water production plants have been covered in safeguards agreements under procedures analogous to those designated to apply to nuclear material.

[170]In adopting this approach, the Agency took a step in the direction of assimilating the non-NPT (INFCIRC/66) and the NPT (INFCIRC/153) safeguards documents in closing an avenue for acquisition of nuclear material outside of safeguards and it strengthened the non-proliferation utility of international safeguards.

CHAPTER V. THE NEGOTIATION PROCESS OF THE NPT

A... Prologue to the NPT Negotiations

In contrast to the negotiations on the Statute of the IAEA, the negotiations of the Non-Proliferation Treaty did not constitute a follow-up of one decisive initiative. On the contrary, they evolved gradually from the prolonged and unsuccessful negotiations on the general and complete disarmament of the 1950's. Already in 1956, it was suggested that measures to prevent the spread of nuclear weapons could be made part of a wider disarmament package. Such measures were seen as a possible supplement to a test ban treaty. The fact that it was possible to construct a small nuclear device without having to test it, was perceived as a loophole that needed to be filled in order to achieve complete control of nuclear proliferation.[171] As the negotiations on a comprehensive test ban dragged out and ran into trouble because of superpower disagreement on the issue of inspections, there was an increasing awareness of the need for other non-proliferation measures. The spread of plutonium that was taking place in connection with nuclear industrialisation world-wide at the end of the 1950's also increased the danger of a continuous spread of nuclear weapons. The allocation of US plutonium to other countries in the wake of the "Atoms for Peace" policy was partly responsible for creating such a potential in more and more countries.[172] The first constructive political initiatives that were taken to address this situation were a row of proposals submitted by Ireland to the UN General Assembly and other UN organs, beginning in 1958 and resulting in the adoption of the *Irish Resolution* by a unanimous vote on 4 December 1961. *The essence of the resolution was that the nuclear weapon powers should undertake not to transfer nuclear weapons to other states, and that the existing non-nuclear weapon states*

[171] Chalmers M. Roberts, *The Nuclear Years: The Arms Race and Arms Control, 1945-70*, New York, London, Praeger Publishers,1970, pp: 68-69.

[172] But such potential was also the natural consequence of nuclear industrialisation itself, especially in countries that chose to construct reactors using natural uranium for fuel and heavy water for moderator.

should voluntarily forego their right to make nuclear weapons. The main idea was to prevent nuclear anarchy through the establishment of an international treaty that would be subject to inspection and control. But, in spite of the resolution and in spite of the fact that a new negotiating forum was set up at the end of 1961 by the United States and the Soviet Union, and endorsed by the United Nations, there was no real progress in talks on a non-proliferation treaty until well into 1965. There seems to have been many causes for this lack of progress. Firstly, the US administration apparently pursued several lines of policy whose objectives were seemingly incompatible. Secondly, the members of the North Atlantic Alliance were more and more divided among themselves, with France more and more following its own direction. Thirdly, the Federal Republic of Germany feared that eventual arms control and disarmament agreements would involve wide-reaching settlements in Europe and have negative repercussions on German reunification. Finally the first years of the Kennedy-administration saw a deterioration of East-West relations, with the Soviet insistence on a peace settlement in Europe such as the erection of the Berlin Wall, the unsuccessful US invasion of Cuba, and the American engagement in Vietnam. In addition, 1963-64 saw a change of political leadership at the highest level in both the United States and the Soviet Union.[173]

Kennedy's promotion of arms control and disarmament, which resulted in the creation in September 1961 of the Arms Control and Disarmament Agency (ACDA) within the State Department, was contradicted by two other policy lines. While advocating disarmament, the Kennedy administration in fact implemented a massive arms build-up.[174] It was a second line of policy which created the most

[173]The information provided here is based on the lengthy discussions of the author (taken place at UNIDIR, Geneva, from February to April 1995) with Astrid Forland of the University of Bergen, Norway, and also on her unpublished manuscript, *The Negotiations on the Non-Proliferation Treaty*, March 1995.

[174]Kennedy had come to power maintaining that the United States was lagging behind the Soviet Union in the production of missiles, and he proceeded to devote a large amount of resources to research and development of new weapons systems.

problems at the negotiating table, namely plans for establishing a new multilateral force (MLF) within NATO. The MLF scheme was seen by the US administration as a means to satisfy eventual West German cravings for a nuclear force without having to establish a national German one, and they also saw it as a possible precursor for a future federal European force. The Germans themselves only reluctantly went along with the idea.[175] The plan was in fact laid politically dead by the British in December 1964, but it continued to haunt the NPT negotiations until the autumn of 1966.[176] The special military and political situation of the Federal Republic made it impossible to achieve any real progress in the NPT negotiations until the Americans had reached an understanding with the Russians which, to a certain extent at least, satisfied West Germany's defence interests.[177]

The two nuclear powers, France and the People's Republic of China that did not take part in the negotiations, perceived the NPT as primarily directed at themselves. There can be no doubt that the Chinese nuclear explosion of October 1964 served to underline the importance of reaching an agreement before further proliferation took place. The Chinese detonation, furthermore, directly influenced India's stance at the negotiating table and consequently also the outcome of the negotiations. India was a civilian nuclear power in its own right, and the Indians

[175]The German supporters of the plan primarily saw it as a means to keep the Americans in Europe. Furthermore, the history of the NPT negotiations seems to indicate that they also came to see it as a means to prevent the non-proliferation treaty.

[176]German opposition to the NPT was enhanced by the way the Limited Test Ban Treaty was negotiated. In the final stages, the superpowers negotiated among themselves in Moscow, and no allied consultations took place prior to the agreement. This procedure caused anger as well as anxiety in Germany. The West Germans were particularly unhappy about the fact that the Democratic Republic of Germany was allowed to sign the treaty. In the 1950's, the Federal Republic had likewise reacted strongly to a European aerial inspection scheme involving inspections over German territory. Negotiations between the two superpowers on such a scheme caused chancellor Konrad Adenauer to go to Washington to insist that disarmament should come after, not before the reunification of Europe. See, Forland, ibid., p. 2.

[177]The conventional interpretation of the NPT negotiations is to look upon the MLF issue as the greatest impediment to progress in the negotiations. There seems to be good reason to look at it the other way round. To prevent the Germans from acquiring nuclear weapons may well have been the main reason for Soviet interest in a successful outcome of the negotiations. Thus German reluctance to sign a treaty made the Russians more eager to reach an agreement. Ibid., p. 3.

were the most vocal spokesmen of the non-aligned countries. But in spite of the global orientation of the negotiations and the global problem that the non-proliferation treaty was addressing, it is in fact striking to what extent the European context set the framework for the negotiations.

B... Negotiations on the Non-Proliferation of Nuclear Weapons

The most important forum for the NPT negotiations was the Conference on the Eighteen-Nation Disarmament Committee (ENDC). The ENDC was set up by the United States and the Soviet Union in Geneva at the end of 1961, and the two superpowers co-chaired the meetings of the ENDC right through the NPT negotiations. The establishment and the composition of the Eighteen-Nation group were endorsed by the United Nations General Assembly, but the new body was not an organ of the United Nations. However, the UN Secretariat served the Conference, and a representative of the UN Secretary-General was present at the Conference at all times. Moreover, the Conference submitted reports and records to the UN Disarmament Commission and to the UN General Assembly. The ENDC was in fact a supplement to the UN fora. The issues that were raised within the Eighteen-Nation group continued to be discussed at the UN Disarmament Commission, at the annual sessions of the General Assembly.

i... The Work of the ENDC

The setting up of the ENDC probably reflected a need for a smaller and more informal body than the United Nations organs. It was composed of five NATO countries (Canada, France, Italy, the United Kingdom and the United States); five Warsaw Pact countries (Bulgaria, Czechoslovakia, Poland, Romania and the Soviet Union); and eight Non-Aligned countries (Brazil, Burma, Ethiopia, India, Mexico, Nigeria, Sweden and the United Arab Republic). The composition of the group reflected the fact that the non-aligned had won a position for themselves as a third major grouping in the United Nations, besides the East and the West, in matters of disarmament.[178] Although the ENDC became the major negotiating forum for the Non-Proliferation Treaty, it was never a forum specifically dedicated to the NPT, and it started its proceedings in 1962 by continuing the discussions on general and complete disarmament.[179] In 1963 intensive discussions on a limited test ban treaty dominated the forum. Definite agreement for putting the Non-Proliferation Treaty on the agenda only came on 18 June 1964. In spite of the detonation of the Chinese bomb on 16 October 1964, which undoubtedly highlighted the danger of further proliferation, the ENDC was not convoked at the beginning of 1965, partly due to disagreement between the two superpowers.[180]

A breakthrough for serious negotiations only came with the assembling of the UN Disarmament Commission, at the request of the Soviet Union, between 21 April and 16 June 1965. During this session the non-aligned countries were particularly active. India proposed a solution of nuclear weapons proliferation comprising five elements, and Sweden argued for a package linking a non-proliferation agreement to a comprehensive test ban and a cut-off of fissile materials. The session culminated by the vote of a resolution recommending the ENDC to give priority to discussions of a non-proliferation agreement.[181] This meant tying the link with the *Irish Resolution,* which already had represented a concept for treating nuclear non-proliferation separately from other arms control and disarmament problems.

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[178]The first Conference of Heads of States or Governments of non-aligned countries had taken place in Belgrade in September 1961. In a declaration from the meeting the non-aligned countries had demanded to be represented in all future global conferences on disarmament. The Soviet Union and the United States in fact accepted this principle when they set up the ENDC in December 1961.
[179]It was the Cuban missile crisis that finally shifted the focus from general disarmament measures to what became known as collateral ones.
[180]Mohamed I. Shaker, *The Nuclear Non-Proliferation Treaty: Origin and Implementation, 1959 - 1979*, New York, London, Rome, Oceana Publications, Inc., 1980, Vol. 1, p. 91.
[181]Ibid., p. 93.

ii... First Drafts of the Non-Proliferation Treaty

The first draft proposals put forward by the United States and the Soviet Union, respectively on 17 August at the ENDC and on 24 September 1965 at the UN General Assembly,[182] confirmed the fundamental disagreement between the two superpowers regarding the definition of nuclear spread. While the Americans advocated a definition that would allow for the so-called nuclear sharing within the military alliances, the Russians were vehemently opposed to it. The question had been hotly debated since the creation of the ENDC.[183] Given that the MLF issue had already blocked progress regarding a non-proliferation agreement for several years, the representative of the United Arab Republic suggested in the General Assembly that the Assembly should not concentrate on the two superpowers' draft proposals, but should instead lay down some basic principles upon which a treaty could be built. A formal resolution (Resolution 2028 x) was submitted by the eight non-aligned ENDC members calling for *five basic principles* to guide the negotiations:

1... the treaty should be devoid of loopholes which might permit proliferation;

2... it should embody an acceptable balance of mutual duties and obligations of the nuclear and the non-nuclear powers;

3... it should be a step towards the achievement of a general and complete disarmament, and, more particularly, nuclear disarmament;

4... it should include provisions to ensure the effectiveness of the treaty;

5... nothing in the treaty should prevent any group of countries to conclude regional nuclear-free zones.

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182 Ibid., pp: 94 - 98.

183 Interestingly enough, only three months before the Cuban missile crisis, the Soviet ambassador had proposed an agreement between the nuclear powers not to deliver nuclear weapons, control over them, or information necessary for their production to states that did not themselves possess nuclear weapons. The proposal reflected the Soviet concern about American plans for the creation of a multilateral nuclear force within NATO. As always, the Americans refused such an approach, maintaining that an eventual multilateral force would not lead to proliferation. Ibid., pp: 87 - 89.

iii... Concerted Action of the United States and the Soviet Union

These principles represented a summary of years of negotiations, and a compromise not only between the positions of the superpowers but also of the non-aligned countries themselves. The next year saw bilateral negotiations between the superpowers as well as new sessions of the ENDC. A revised American draft was presented in March 1966, but the big breakthrough only came in the Autumn of 1966, during the annual session of the UN General Assembly. On 19 October, at a NATO Council meeting, a majority of allied countries advocated a definition of *nuclear spread* which would not allow the establishment of a new multilateral nuclear force. This decision was prepared first of all through bilateral German-American discussions. Secondly, through bilateral Soviet-American talks about the existing allied defence arrangements, and through a Senate debate and resolution which gave unanimous support to president Johnson's efforts to achieve a non-proliferation treaty.[184] Finally, through the elaboration of a plan for nuclear policy planning within NATO, which would give the Germans a say in the planning of their nuclear defence, without giving them access to nuclear weapons.[185] The breakthrough was consolidated by the passing of several resolutions in the General Assembly expressing support of the negotiations. One resolution, based on a Pakistani idea, decided that a conference of non-nuclear weapon states was to be held no later than July 1968, thus putting pressure on the negotiators to achieve a result before that time.[186]

[184] The Senate passed a resolution to this effect, well aware that an agreement with the Russians was conditioned on the relinquishment of multilateral nuclear schemes, and that an agreement with the non-aligned powers was conditioned on the superpowers' willingness to give something in return for the non-nuclear powers' renunciation of nuclear weapons. The resolution which was put forward by senator John O. Pastore on 18 January 1966, was passed on 17 May 1966. See Congressional Record - Senate of 17 May 1966.

[185] This concession was reciprocated by a Russian declaration to the effect that they would not let misgivings about the American warfare in Vietnam be an obstacle to further progress in the negotiations. Forland, ibid., p. 6

[186] Shaker, ibid., p. 103.

The breakthrough meant that the two superpowers between themselves, and probably with bilateral American-British talks thrown in, had more or less come to an agreement concerning Articles I and II of the Non-Proliferation Treaty. These articles contained the main provisions of the Treaty, namely *the obligation of the nuclear weapon powers not to assist in nuclear proliferation and the obligation of the non-nuclear weapon powers to forego the right to make nuclear weapons as well as nuclear devices for peaceful purposes.* The co-chairmen were meant to present identical draft proposals at the opening of a new ENDC session on 21 February 1967. Due to West German frustrations this was not done. The Germans were furious that the Americans once more had reached an agreement with the Russians without prior allied consultations. Even if they had reluctantly accepted to sign a treaty, they would only do so on certain conditions. Consequently, they wished to be consulted regarding additional treaty provisions. West German criticism of the procedure led to the postponement of the spring session of the ENDC. Instead there was a round of consultations. A string of NATO Council meetings took place in the course of April and May. The Federal Republic consulted intensively with other threshold countries. Even the Soviet Union held consultations with its allies.[187]

iv... Issues and Debates

The issues of debate were the verification provisions of the treaty and the question of what the non-nuclear weapon powers would get in return for their renunciation of nuclear weapons. The Federal Republic insisted on substantial and procedural limitations with regard to treaty provisions. To achieve this aim Germany collaborated closely with other reluctant countries like India and Switzerland, but most especially with Italy and Japan. This meant that the industrialised countries that did not take part in the ENDC were fighting for their

[187]The American ambassador, William C. Foster, visited Bonn and other European capitals. The British Minister of disarmament, Lord Chalfont, went to Brussels to consult with the EURATOM Commission. Forland, ibid.

interests in civilian nuclear activities. Italy and the Federal Republic, with the support of other EURATOM countries, were particularly insisting on the preservation of the EURATOM safeguards system. There was furthermore a general concern among the non-nuclear weapons states about the consequences of a treaty for their future security.

a... verification provisions

On 24 August 1967 the Soviet Union and the United States submitted identical draft proposals. The verification provisions were still left open. This marked the beginning of a new round of consultations, discussions and presentation of amendments at the ENDC. The non-aligned members of the ENDC were no longer able to agree among themselves. On 18 January 1968 two identically revised draft proposals were presented at the ENDC by the co-chairmen. A compromise formula had then been reached regarding Article III, i.e. the verification provisions. Consultations and discussions were continuing on a multilateral basis through February the same year. A special procedure was established for non-member countries to the ENDC to present their comments to the Eighteen-Nation group. At that stage it had become clear that India had stopped participating actively in the process.

b... non-nuclear-weapons states

Neither the 18 January 1968 drafts nor the joint draft proposal that was put forward by the co-chairmen on 11 March 1968 contained any provisions regarding guarantees for the security of non-nuclear weapon states. However, the three nuclear powers presented a proposal for a Security Council resolution, in which they would pledge to come to the assistance, through the Security Council, of non-nuclear weapon countries being under nuclear attack or being threatened by nuclear attack. On 14 April 1968 Indian Prime Minister Indira Gandhi confirmed in the Indian

Parliament that her country would not sign the Non-Proliferation Treaty. The co-chairmen maintained that the last draft proposal was the result of prolonged negotiations, and that there was by now a small margin for making changes. Yet a number of amendments were submitted during a session of the UN General Assembly between 24 April and June 1968. Some of these were included in the final draft of the Treaty as well as in a Security Council Resolution on *security guarantees* that was passed on 18 June 1968. *The Treaty was opened for signature in London, Moscow, and Washington on 1 July 1968.* The U.S. President Johnson and the Soviet Prime Minister Kosygin both made a declaration in this connection. Through the adoption of the Irish Resolution, the existing nuclear powers namely, France, the Soviet Union, the United Kingdom, and the United States, pledged their willingness not to assist in the spread of nuclear weapons.

C... Views on Definition of Nuclear Proliferation

i... The French View

Although France voted in favour, the French opted out of the ENDC and they did not take part in the NPT negotiations, nor did they have any intention of signing such a treaty. France considered limited arms controls measures as insufficient and imbalanced, and saw it as a means not only to preserve the monopoly of the existing nuclear powers, but mainly to strengthen the military positions of the two superpowers vis-à-vis other powers. Consequently, the French government considered general and complete disarmament as the only acceptable approach to disarmament negotiations.

ii... The Chinese View

The People's Republic of China, which was not a member of the United Nations, had much the same conception of the NPT negotiations as that of the French government, namely that the aim of the negotiations was to preserve the dominance of the two superpowers, and to keep other powers, and in particular China herself, down. Thus, only three of the then five weapon states participated in the NPT negotiations. And for many years any progress in the negotiations were prevented due to disagreement among these states on the definition of nuclear spread. With few exceptions, the non-aligned ENDC members did not volunteer their opinion on the matter.[188] The solution of this question was the big breakthrough of the negotiations, symbolised by the presentation of the identical draft proposals in August 1967. From then on, the wording of Article I remained virtually unchanged.

iii... The American View

As shown above, the heart of the matter was whether the Non-Proliferation Treaty should allow nuclear sharing within military and indeed political alliances or not. What made the issue a particularly hot one, was the fact that the nuclear sharing in question primarily was meant to accommodate the interests of the Federal Republic of Germany. The first American draft proposal of 17 August 1965 did not only keep the MLF option open. By asking for the prohibition of transfer of nuclear weapons to the national control of non-nuclear weapons states, and the prohibition of an increase in the total number of nuclear weapon states, it in fact held open the possibility of two kinds of transfer:

1... it opened for the transfer of nuclear weapons from a nation state to an organisation provided the total number of nuclear weapon states did not increase.

2... it would allow the creation of a new political entity having nuclear weapons at its disposal if a former nuclear state turned its nuclear arsenal over to the new entity. This alternative was called the "European option", and the intention behind it was to keep open the possibility to create a federal European state that would be

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[188]Shaker, ibid., pp: 167-168.

based on a nuclear defence.[189] As regards the transfers from one weapon state to another, the US could never agree to any transfer of complete nuclear weapons in peacetime, as this was against their domestic legislation.

iv... The British and the Soviet Views on the American Proposal

The American draft proposal had been subject to debate within NATO before presentation. Several of the smaller countries were lukewarm to the idea of giving the Federal Republic of Germany more access to nuclear weapons than they already had. The United Kingdom was strongly opposed to the plans for a MLF force and had in reality laid it dead at the end of 1964. Neither the British nor the French were willing to relinquish control of their national nuclear arsenal. During the summer of 1965 the United Kingdom circulated her own alternative draft proposal which was based on a definition of nuclear spread which would not allow nuclear sharing schemes. If the majority of NATO countries disliked the idea of German nuclear weapons, the Russians abhorred it. On 24 September 1965 they presented a draft proposal to the UN General Assembly which explicitly prohibited transfer of nuclear weapons through military alliances to national control. They made it clear that an eventual creation of new nuclear forces within NATO would be contrary to continued East-West détente. And they accused the United States of obstructing the negotiations by putting forward demands that the Federal Republic be allowed access to nuclear weapons.[190]

v... The U.S. Deal with the Soviets

The Soviet government insisted on closing all loopholes through which a spread of nuclear weapons could be brought about. Although by all accounts, the nuclear sharing scheme was politically dead at this stage, the Americans continued in

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189 Ibid., pp: 216-217.
190 Forland, ibid., p. 9.

bilateral talks with the Russians to argue for the necessity to acknowledge the Federal Republic's need for adequate defence. They pointed to the fact that hundred of Soviet missiles were directed at the German territory, and they claimed that it was reasonable that a country in such a position be allowed to take part in nuclear planning. They put pressure on the Russians by claiming that unless the West Germans were allowed to take part in the planning of their own defence, the Americans feared they would demand their own nuclear weapons. President Johnson later explained that the U.S. government had sought to get the Soviet government to accept three conditions:

1... the continuance of the existing two-key arrangements within NATO;

2... the establishment of a nuclear planning group within NATO;

3... the preservation of the European option, i.e. "the preservation of the right of a United Western Europe, if it ever developed, legally to succeed the United Kingdom and France as a nuclear power".[191]

In the autumn of 1967, the foreign secretaries of the United States and the Soviet Union, Dean Rusk and Andrei Gromyko respectively, came to a mutual understanding by which the establishment of a nuclear planning group as well as existing defence arrangements were tacitly accepted by the Russians. As already mentioned, the breakthrough followed in the wake of a NATO Council meeting in which the majority of the members opted for a definition of nuclear spread that would not allow for multilateral nuclear sharing. The compromise probably also implied that the Federal Republic had reluctantly accepted that it would have to sign the Non-Proliferation Treaty, although disagreement on this issue within the Federal government itself created uncertainty about the West German position until the Federal German ratification of the Treaty was a fact.

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[191]Shaker, ibid., p. 233.

The presentation of identical Soviet and American draft proposals in August 1967 reflected the agreement that the two superpowers had come to with regard to the definition of nuclear spread. The formula reached then was never much altered, except for the fact that transfer became prohibited to all recipients, so that individuals as well as states and organisations were included. However, a definition of a *nuclear weapon state* was never agreed upon. Analysts have interpreted this lacuna as a reflection of the Soviet-American understanding. By avoiding a precise definition, the terms could be given a broader meaning than would otherwise have been possible, thus allowing for existing alliance arrangements. Nevertheless, the Non-Proliferation Treaty defined which countries that were to be reckoned as nuclear weapon states; namely those countries that had detonated a nuclear device before 1 January 1967.[192]

D... Security Guarantees : Requests & Offers

From the outset of the negotiations the question of how to guarantee the security of states that renounced the right to make nuclear weapons became a major issue of debate in the Eighteen-Nation group and in the wider forum of the UN General Assembly. The security guarantees issue was perceived as a problem which concerned non-aligned countries in particular. But even members of alliances with special security problems, like the Federal Republic of Germany, were worried about signing the Non-Proliferation Treaty without first getting a kind of guarantee from the nuclear powers for their future security.

i... Security Concerns of India

The security guarantees issue first came to a head in the wake of the nuclear explosion of the People's Republic of China in 1964. China's *going nuclear* was perceived by the government and people of India as a grave threat to India's

[192] Forland, ibid., pp : 10 - 11.

security. The fact that it took place so shortly after the Chinese-Indian border war only added to the gravity. In May 1965, the Indian representative to the UN Disarmament Commission made a point of the unfortunate coincidence of the Chinese detonation with the starting up of serious negotiations on the Non-Proliferation Treaty. India's representative further emphasised India's agreement with countries which maintained that it was unrealistic to ask countries to forswear forever a programme of nuclear weapons production, so long as the existing nuclear powers continued to hold on to their arsenals, and so long as new countries embarked on nuclear programmes. While reaffirming India's determination not to use nuclear energy for military purposes, the Indian representative, nevertheless, expressed fears that unless the world community did something to reverse the existing situation of proliferation, there was hardly any likelihood of preventing further proliferation.

The Indian suggestion for a solution to this problem was the establishment of an integrated agreement. By an integrated agreement was meant that, the renunciation of nuclear weapons on the part of the non-nuclear weapons states had to be reciprocated in the same treaty by commitment on the part of the nuclear powers to stop vertical proliferation, and even to reduce existing stockpiles. Furthermore, the non-nuclear weapons states would have to get some kind of assurance that could really be depended upon as to their security. India got much support from other non-aligned countries. With regard to assurances, Canada also showed much understanding for the position of the non-aligned countries. Prior to the presentation of the first American draft proposal in August 1965, Canada had advocated the introduction of guarantees from the nuclear powers in the draft, but to no avail.[193]

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[193] Forland, ibid., p . 12.

ii... Proposals for Security Guarantees

In the course of 1964-65 both the Unites States and the Soviet Union proposed ways to satisfy the quest for security guarantees. The United States offered a so-called *positive guarantee,* and the Soviet Union proposed a *negative guarantee.*

a... positive security guarantees

The American version was first formulated by President Johnson in reaction to the Chinese nuclear detonation. President Johnson declared the U.S. willingness to come to the defence of non-nuclear countries in case of nuclear attack on any such country. The declaration left the impression that the United States was willing to become a kind of guarantor against nuclear attack on a global scale. During the UN General Assembly session in 1965, U.S. delegates followed up and modified their President's declaration by suggesting that assurances given in connection with the Non-Proliferation Treaty might take the form of a UN General Assembly resolution. That is, a resolution which would imply that any action would be conditional upon agreement within the UN General Assembly. This modification might be seen not only as a retreat from the earlier U.S. position, but also as a way to accommodate countries like Sweden, which maintained that a positive guarantee *à la* the one suggested by President Johnson would be contrary to Sweden's neutrality, and could therefore not be accepted.[194]

b... negative security guarantees

The Soviet proposal of a negative guarantee was put forward by the Soviet Prime Minister Kosygin in 1965, and became known as the *Kosygin formula.* The formula suggested a formal undertaking by the nuclear weapon states not to use nuclear weapons against non-nuclear weapons states that were parties to the treaty. It put as a condition that no transit of nuclear weapons must take place on the

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[194]Ibid.,

territory of the non-nuclear weapons state.[195] Kosygin's proposal was at first perceived by some countries as a step in the right direction, because it would reduce the threat of nuclear attack, and in the course of the negotiations three proposals on negative guarantees were submitted at the ENDC, respectively by Switzerland, Romania and the United Arab Republic. However, such proposals were not generally accepted. India did not consider negative guarantees good enough, since China would not be signing a Non-Proliferation Treaty. The U.S. government did not like the Kosygin formula either, although the Americans were vague about their views in public. The Americans did not welcome the Kosygin formula because the formula was both aimed at the F. R. Germany on which territory British and American nuclear arms were deployed, and it was aimed at the NATO's *flexible response strategy* which did not exclude the use of nuclear arms in a conflict.[196]

c... non-aligned reactions

To many non-aligned countries, the Soviet and the American proposals looked like mere 'paper tigers'. By the summer of 1967, India seemed to have relinquished any hope of reliable guarantees. Security assurances were more and more perceived as useless in New Delhi. The negative version had no or very little value for India for which China represented the big threat. Indian officials, furthermore, indicated that the positive guarantee had lost much of its promise after the *six-days-war* in the Middle East. According to one Indian interpretation, the two superpowers had kept very quiet during the conflict for fear of confrontation. Thus India did not think China needed to worry about superpower retaliation in case they attacked India. The main lesson to be drawn from the regional conflict in the Middle East was that - with or without guarantees - India had to take responsibility for its own defence.

[195]Mohamed I. Shaker, *The Nuclear Non-Proliferation Treaty: Origin and Implementation 1959 - 1979*, New York, London, Rome, Oceana Publications, Inc., 1980, Vol. II, p.496.
[196]Shaker, ibid., vol. II., p. 497.

d... West German reaction

The Federal Republic of Germany emerged as another strong advocate of the interests of the threshold countries, including demands for security guarantees. Like India, West Germany too, wanted assurances that could be relied upon. One way of achieving binding commitments was to make them part of the Treaty. India had already voiced such a request, to no avail. Then, West Germany became a spokesman for the same demand. Furthermore, the Germans put great emphasis on the inclusion of guarantees against *nuclear blackmail*, that is threatening to use nuclear arms, as well as nuclear aggression. Their demands were presented formally to the ENDC in a memorandum on 8 March 1968.

e... nuclear powers' response

Apparently, serious negotiations among the three nuclear powers on the issue of security guarantees only started in connection with the drafting of the two identical 18 January 1968 proposals. At that stage, the Soviets were still defending the Kosygin formula, which the Western powers could not accept for reasons mentioned above. Thus, no mention of security guarantees were made in the draft. When a draft for a Security Council Resolution was finally presented in April 1968, it included assurances by the nuclear powers that they would come to the rescue of countries being threatened by nuclear attack as well as of countries being under nuclear attack. The three powers promised each to give a formal declaration to this effect in connection with the passing of such a UN Security Council resolution. Furthermore, similar assurance would be given in a preambular paragraph of the Treaty. During the final discussions of the Non-Proliferation Treaty in the UN General Assembly in May/June, Mexico and Japan submitted amendments to the Treaty and the Security Council Resolution, for provisions promoting the principles of the UN Charter concerning threat or the use of force in international relations. This was meant to strengthen the commitments, and was generally accepted.[197]

f... current situation

Still, the commitments of the nuclear powers could not be seen as firm commitments since any of the permanent members of the Security Council would be able to veto any action they might disapprove of. Thus they were generally interpreted as totally valueless in real terms, but useful negotiation wise. The Federal Republic of Germany wasn't reassured by these guarantees in form of references to the UN Charter, and sought to obtain more specific guarantees from the United States with regard to European security. The West Germans in particular asked for and got American commitment regarding the provision of security in the case that NATO was to be dissolved. This request led to several American declarations. Further reassurances were given in the course of the ratification process.[198] With these US commitments to NATO and the defence of Europe, the government of the Federal Republic of Germany had achieved the reassurances it had asked for and made its ratification of the Non-Proliferation Treaty conditional upon. But the effort to involve the two superpowers in new and more far-reaching commitments than those undertaken in the context of the alliances had not met with success. While this probably was a reflection of what was politically feasible, it also reflected that the nuclear powers did not accept that renunciation of nuclear weapons was a sacrifice.

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[197]Forland, ibid., p. 13.

[198]The Foreign Committee's report to the Senate cited former Foreign Secretary Rusk to the effect that Articles I and II of the Non-Proliferation Treaty would "in no way" prevent the United States from honouring its commitments within the Western Alliance regarding existing defence arrangements; deployment of nuclear forces throughout the world; or transfer of nuclear arms or transfer of the control of nuclear arms to another nation in the case of war. Again citing Rusk, it was pointed out that the Treaty only dealt with what was prohibited, not with what was allowed. Thus the Treaty did not prohibit transfer of delivery vehicles, or transfer of control of delivery vehicles so long as the transfer did not include bombs or warheads. Neither did it prohibit allied consultations regarding nuclear defence or arrangements for deployment of nuclear weapons on allied soil. The United States was moreover not prohibited from using nuclear weapons in any situation wherein non-use would be inconsistent with U.S. security interests. And finally, the Treaty did not deal with the question of European unity, and did not prohibit a federal Europe to succeed to the nuclear status of one member of the federation. Forland, ibid., p. 14.

E... Issues Discussed on Arms Control and Disarmament

The arms control measures that followed in the wake of the Cuban missile crisis: the Partial Test Ban Treaty (PTBT -1963), the later Treaty on the Prohibition of the use of Outer Space for military purposes (1966), and the Non-Proliferation Treaty (1968) were not disarmament measures in the sense that they reduced existing weapons arsenals. The main objective of these three treaties was to halt the spread of weapons, and in particular nuclear weapons, by making it more difficult or even illegal to produce them. The Partial Test Ban Treaty furthermore had a very positive effect in reducing the radioactive contamination of the earth. But none of these treaties by themselves reduced the nuclear proliferation of the existing nuclear weapon powers, the so-called *vertical proliferation*. They were therefore less ambitious than the complete arms control and disarmament measures that had been discussed in the United Nations in the 1950's, when a comprehensive test ban treaty had been the main goal. This goal was given up due to superpower disagreement on the number of yearly inspections that were warranted in order to verify an eventual ban. The abandonment of the approach of general and complete disarmament in favour of collateral arms control measures was a great disappointment to many countries. It made France withdraw from the disarmament negotiations, maintaining that the Partial Test Ban Treaty as well as the Non-Proliferation Treaty would but represent measures to maintain the privileged positions of the two superpowers. China, of course, held much the same view, and claimed that the American-Soviet agreements were directed toward preventing China from gaining parity with them. Many countries participating in the negotiations were also unhappy about the fact that the Non-proliferation Treaty would not prevent vertical proliferation. For this reason the first draft proposals submitted respectively by the Americans and the Russians in 1965 were strongly criticised by many countries. It was pointed out that the obligations of the nuclear powers and the non-nuclear weapons states, as expressed in Articles I and II, were only symmetrical with regard to transfer of weapons and assistance in production of weapons. They were asymmetrical when it came to manufacture of nuclear weapons. Whereas the non-nuclear-weapons states would pledge not to manufacture nuclear weapons, the existing nuclear powers would not.

i... Non-Aligned Concern with Vertical Proliferation

Already before the presentation of the two draft proposals, India and Sweden had made it known that they were not keen on a non-proliferation treaty in which the superpowers made no contribution of their own toward slowing down the nuclear arms race. And they were supported by other non-aligned countries, like Yugoslavia. The position of the non-aligned regarding this issue must also be seen on the background of the nuclear arms build-up initiated by both superpowers in the early 1960's, the deployment of which was beginning to lurk in the horizon. The question of whether to deploy anti-ballistic missile (ABM) systems or not, was a matter of particularly great importance in this connection because of the consequences of such systems for nuclear strategy. If countries started to act on the belief that they could survive a *first strike*, the world would become a much more dangerous place. In such a situation, many countries saw a great need for arms limitations, and there was considerable fear that once a non-proliferation treaty was a reality, the superpowers would lose interest in further arms control measures.

Non-nuclear weapons states were not alone in harbouring such fears. There was, of course, a growing awareness of the danger of nuclear war in the public opinion world-wide, and the number of organisations and individuals campaigning against the nuclear arms race was ever increasing. Consequently, there was strong political pressure on the nuclear powers both inside the negotiating fora and outside for meeting such fears with substantial measures. Also, the nuclear powers well understood that they had to give something in return for the renunciation of nuclear weapons by the non-nuclear weapon states. Thus, they accepted the incorporation in Resolution 2028 of two guiding principles that acknowledged the need for reciprocity. Firstly, the resolution ruled that:

1... the Non-proliferation Treaty should be based on an acceptable balance of obligations of nuclear and non-nuclear powers; and

2... the Treaty should represent a step towards disarmament, and in particular, nuclear disarmament.

a... the non-aligned memorandum

The wishes of the eight non-aligned ENDC members regarding disarmament were put forward in a joint memorandum. They, in particular, favoured:

1... a cut-off of fissile materials production for military purposes;

2... a reduction of existing arms stocks; and

3... a comprehensive test ban treaty.

While the Western nuclear powers pledged support for such measures and even promised to work for agreements of the kind listed in the memorandum put forward by the eight non-aligned countries. Nevertheless, the nuclear weapons states also warned against making the Non-Proliferation Treaty *dependent* upon the implementation of additional measures. The problem with the kind of measures listed in the memorandum was that, although the Western powers supported them in principle, the United Stated, in particular, would not agree to such agreements unless they included provisions for reliable verification. And the former disagreements between the Soviet Union and the United States concerning verification were still very much in existence. In addition, both superpowers were reluctant to accept restraints on themselves that would not apply to China.

b... nuclear powers' response

Following the breakthrough in the negotiations in the autumn of 1966, the question of link between the Non-Proliferation Treaty and other disarmament agreements became a major issue in the bilateral discussions that took place between the Soviet Union and the United States. In March 1967 it became known that the two superpowers were to begin talks on possible ways of limiting the arms race. The Soviet government had agreed to enter into such talks on the condition that the talks would cover both offensive and defensive missiles. *The presentation of the two identical draft proposals of August 1967, on the other hand, made it clear that the superpowers were not going to accept links between the NPT and other disarmament measures.* Like earlier draft proposals, the ones submitted in 1967 only provided disarmament and arms control commitments in general terms. And these were not made part of the operative text, but were contained in three preambular paragraphs.

c... non-nuclear weapons states' insistence

The non-nuclear weapons states were still insisting that the Non-Proliferation Treaty should represent a step in a process leading towards a complete and general disarmament agreement. The more demanding were still asking for specific measures to be incorporated in the text. As late as October 1967, the Indian ambassador said that a halt of production of fissile materials for military purposes was the only possible basis for a NPT. At the very least, they wanted a strengthening of the disarmament provisions through a separate treaty article. Mexico and Sweden submitted proposals to that effect, and were supported by many other countries, including the Federal Republic of Germany. Such an article (i.e., Article VI) was included for the first time in the two identical draft proposals of 18 January 1968. In Article VI the nuclear weapons states pledged to pursue negotiations regarding "cessation of the nuclear arms race". Romania had repeatedly put forward proposals suggesting that the nuclear weapons powers should at least pledge to undertake adopting specific measures. More conciliatory countries were content with a pledge by the nuclear powers to pursue negotiations in *good faith*. Mexico submitted a proposal to this effect which became part of the final treaty text.

ii... Final Phases of Negotiations

During the final phases of the negotiations, the superpowers were particularly keen to accommodate Swedish proposals, because they regarded Sweden as a leading light among the non-aligned countries. Thus, the first joint treaty draft of 11 March 1968 incorporated two Swedish amendments to Article VI, in addition to a new preambular paragraph on nuclear weapon testing. The main change suggested by the Swedes was a qualification of the disarmament pledge by introducing a *time factor*. The superpowers then accepted to pursue negotiations regarding "cessation of the arms race at an early date". The wish to introduce such a time factor had been expressed by many countries in the course of the negotiations. Amendments suggested by other countries were not taken into consideration by the co-chairmen at this stage. In the final text the nuclear weapons states pledged "to pursue negotiations in good faith to achieve effective measures relating to cessation of the arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control." This meant that the nuclear powers did not commit themselves to achieve anything, only to negotiate in good faith. However, their willingness to negotiate was demonstrated already at the opening for signature of the Treaty, when they announced their intention of starting negotiations on defensive and offensive missiles.[199] Furthermore, the pressure on the nuclear powers to achieve some results with regard to disarmament was increased through the review provisions of the Treaty. In order to review the operation of the Treaty, provision for a review

[199]Forland, ibid, pp: 17 - 18.

conference to be held after a certain period of time had already been included in the first American draft proposal. The paragraph had been added to allay the fears of those countries which thought the Non-Proliferation Treaty might not be followed up by further disarmament measures.[200]

iii... Inclusion of Review Conferences

The failure to specify the disarmament commitments of the nuclear powers led the non-nuclear weapons states to ask for a strengthening of the review mechanism, by suggesting regular reviews of the Treaty. Towards the end of the negotiations, the Swedes let it be known that they wanted reviews every five years.[201] The West German memorandum of 15 March 1968 also asked for regular reviews, and The Federal Republic of Germany got support from Belgium and Italy during internal NATO discussions of this issue. The Americans were willing to accept regular reviews already in January 1968, but the Russians held back until the final discussions in the UN General Assembly. They then accepted two amendments, with the view to making the disarmament commitments stronger. First, a provision was added opening for periodic reviews of the Treaty at interval of five years, if a majority of countries wanted it. Second, it was specified that the review would include preambular commitments as well as the provisions of the Treaty. Review of the preambular paragraphs was included because the disarmament commitments were more strongly phrased in the preamble than in the Treaty articles.[202]

F... Negotiations on the Safeguards Provisions of the NPT

After an agreement had been reached on a definition of nuclear spread, the question of a *safeguards* article (i.e., Article III) became the biggest bone of contention of the negotiations. *Whereas the first Soviet draft proposal did not contain a text regarding*

200Shaker, ibid., vol. II., pp: 871-872.
201Swedish proposal of 8 February 1968.
202Forland, ibid., p. 19.

safeguards provisions, the first US draft proposal included an Article III which in very general terms indicated that safeguards would be taken care of through application of IAEA or equivalent international safeguards.[203] The American draft thus seemed to reflect the breakthrough that had taken place with regard to IAEA safeguards in 1964, and which had resulted in the negotiating of a whole new safeguards regime by September 1965. The breakthrough was due to a change of the Soviet government's attitude to international safeguards. At the outset, this change of attitude did not seem to affect the Soviet position regarding safeguards in connection with the NPT.

i... Issues and Debates on International Safeguards

From the very beginning the Soviets made it clear that they would not accept the application of safeguards on their own territory. They were thus insisting on establishing the same asymmetry between nuclear and non-nuclear weapons states with regard to Article III as was already agreed upon with regard to the preceding articles (i.e., Article I, and II). Many countries found this difficult to accept. Some countries saw it as a discrimination against the non-nuclear countries. India, which had always been opposed to inspections, and which, as an alternative to inspections, had advocated during the IAEA negotiations that countries should give assurances that fissile material were not converted to military use, then insisted that controls should either be applied to civilian nuclear activities in *all* countries or in *none*. A small number of other threshold countries such as Brazil, shared India's misgivings. Apparently, these countries were predominantly concerned about the imbalance of obligations.

a... commercial consequences of safeguards inspections

Many more countries were concerned or pretended to be concerned about the commercial consequences of asymmetrical safeguards. Canada, Switzerland, Japan,

[203]Shaker, ibid., vol. II., p. 655.

Italy, the Federal Republic of Germany among others feared that inspections could function as industrial espionage and give nuclear weapon powers a commercial advantage over non-nuclear states. They therefore demanded the application of international safeguards on peaceful nuclear activities within the territories of the nuclear weapon powers as well as on all transfers of source and fissile materials and equipment to these states. The Federal Republic of Germany was particularly adamant in its insistence on the danger of industrial espionage, and the Germans resented the thought of Russians inspecting German plants. They also feared that controls could be used to hamper production of fissile materials in non-nuclear weapons states, and that such states as a consequence would lose out in the competition of export of reactors because they would not be able to deliver the fuel to go with the reactors. The West Germans maintained that they had already had the experience of losing contracts due to the fact that they had not been able to furnish the reactors with fuel.

b... West German concerns with safeguards procedures

The Federal Republic had succeeded in preventing the presentation of identical American and Soviet draft proposals in February 1967, by insisting on the need for Allied consultations. More than anything, the Germans feared that the Americans and the Russians would agree on a safeguards regime that would be detrimental to German interests. The Federal Republic's main interest was the preservation of EURATOM controls. And on this issue, the Germans were supported by the other members of the European Community, and in particular Italy and Belgium. The wish to preserve EURATOM reflected the same *Gaullist* political aspirations that had contributed to making the MLF such a hot issue. EURATOM was strongly identified with the European integration process, and a weakening of its functions was therefore difficult to accept for the proponents of a federal Europe. In addition to such grand political considerations, the West Germans generally preferred

EURATOM controls to IAEA controls because the former were less intrusive, being only applied to fissile materials and not to facilities. And the Germans maintained that international inspections was equivalent to industrial espionage. Another factor that caused anxiety among the EURATOM countries in general was fear the that a non-proliferation treaty would prevent the United States from honouring its agreement with EURATOM, and that consequently the EURATOM members would be prevented from receiving fissile materials from the Americans in the future.

ii... Consultations Among the States

The main objective of the consultations held in the spring of 1967 was to formulate a common allied position regarding Article III. Giving in to persistent demands, not the least from Canada, the United States and the United Kingdom accepted to put all their civilian industry under the IAEA safeguards. In July 1967, the Soviet Foreign Minister Andrei Gromyko told his American counterpart Dean Rusk that the Western nuclear powers could do as they pleased, but the Soviet Union was not going to accept inspections. Thus, the two identical draft proposals that were presented in August did not include any provisions for international safeguards on nuclear activities in nuclear weapon states. By this stage, Sweden, by all accounts, decided that they had enough of the German-led procrastination, and declared that they accepted - albeit reluctantly - to allow the nuclear powers to be their own judges as to when to apply safeguards on their peaceful nuclear activities. But, the Swedes suggested all the same that safeguards on transfer of special nuclear materials from one state to another should be applicable to all parties. The reason given was that they wished to prevent states that renounced nuclear weapons from helping the nuclear powers to maintain their monopoly.[204]

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[204] Forland, ibid., p. 21.

a... the U.S. memorandum

In March 1967, the Americans distributed to the other NATO countries a memorandum suggesting several concessions to the EURATOM countries. The Americans promised to try to negotiate a permission of transfer of fissile materials as well as equipment from nuclear powers to non-nuclear weapons states for peaceful purposes, even in cases when the materials and equipment might be used for military purposes. They furthermore promised to advocate that regional controls should be accepted in principle so that the IAEA functions in practical terms would be to verify EURATOM controls. The Americans did not themselves believe it possible to get Soviet acceptance of these concessions, but they were willing to try in order to achieve consensus within NATO.

b... Soviet reaction

There had already been signals that the Soviets were willing to modify their position in order to get a West German signature. At the IAEA General Conference in September 1966, Czechoslovakia and Poland both offered to accept IAEA safeguards of their nuclear installations if the Federal Republic of Germany did the same. Later the German Democratic Republic made a similar offer. In May 1967 the Soviets told the Americans that they wanted a straight IAEA formula, and by September that year the Americans came to the conclusion that the Russians wanted safeguards as much as did the Americans. In the end, the Soviets also accepted to make exemptions for EURATOM controls. Thus a final paragraph was added permitting the IAEA to enter into an agreement with another international organisation concerning safeguards. At one point the Americans had suggested that, unless such an agreement was reached in three years after ratification of the Non-Proliferation Treaty, the IAEA safeguards would automatically go into function. Due to strong resistance among EURATOM countries to this so-called *guillotine-clause* it was taken out.

c... Soviet-American consensus on Article III of the NPT

The joint American-Soviet draft proposal of January 1968 included for the first time a complete Article III, including the final paragraph allowing the IAEA to collaborate with other international organisations concerning safeguards. Still, Article III made the IAEA safeguards provisions the basic control instrument of the NPT. Care was taken to allow for revision of the IAEA safeguards without the requirement of an NPT amendment. The safeguards provisions applied to source or fissile materials whether it was "being produced, processed or used in any principal nuclear facility or outside any such facility". The safeguards applied to all relevant material in all peaceful nuclear activities within the non-nuclear states, under the jurisdiction of such states, or carried out under the control of such states elsewhere. Transfer between non-nuclear weapon states of source and fissile materials would likewise be subject to international safeguards. The nuclear weapon states, however, did not accept controls on their imports.[205]

d... reactions to Soviet-American consensus

The threshold countries that had been closely involved in the discussions of the safeguards provisions in the autumn of 1967 were not satisfied with Article III. The reaction to the text both in Bonn and Stockholm, for example, was that it lacked balance. But at the same time it was generally not considered to be politically possible to get a better result. The Article did in fact constitute a considerable progress compared with commitments entered into in connection with the IAEA Statute. Until the Non-Proliferation Treaty came into function, the IAEA safeguards only applied to projects receiving Agency assistance or to projects voluntarily placed under IAEA controls. With the NPT, all fissile materials in non-nuclear countries party to the Treaty would be safeguarded, as would be the transfers of such material

[205]Shaker, ibid., vol. II., p. 667.

between non-nuclear weapons states. Furthermore, two of the existing nuclear powers had pledged to put their civilian nuclear activities under safeguards.

G... Views on Promoting Peaceful Uses of Atom

The fundamental asymmetry of Articles I and II of the Non-proliferation Treaty with regard to the duties and obligations of the non-nuclear and the nuclear weapon states caused much debate at the ENDC. Efforts to reduce the imbalance with regard to Article III were generally not considered by the non-nuclear weapons states to have been very successful, although the fear that the NPT would have a detrimental effect on the development of peaceful nuclear activities in countries that accepted international controls influenced the formulation of Article III. *The Article in fact included a paragraph stating that the safeguards regime should not hamper the economic or technological development of safeguarded states nor should it hamper international co-operation in the field.* However, this was not enough to satisfy the non-nuclear weapon powers, and in the course of the negotiations two more articles, Articles IV and V, were added. The former dealt with the peaceful uses of the atom, and whereas the latter concerned with the so-called peaceful nuclear explosions, (i.e. a programme of using nuclear explosives for engineering purposes, such as digging canals or creating oil deposits).

i... The American View

The question of the use of nuclear explosive devices for peaceful purposes was raised in August 1966 by the Americans. They maintained that there were no technical differences between a nuclear bomb and a nuclear explosive used for peaceful purposes, and that consequently peaceful useful explosions must be reserved for the nuclear weapon states. During the discussions within the ENDC the American delegation brought forth research material which indicated that eventual peaceful uses of nuclear explosions were very limited. This verdict generated the protest of many non-nuclear powers, which interpreted the American position as yet another example of favouring the rights of nuclear weapon powers over the non-nuclear weapons states.

ii... The Non-Aligned View

The most adamant proponents of equal access to peaceful use of nuclear explosives were Brazil and India. The three nuclear powers were from the very beginning determined to include prohibition of nuclear explosives in the general provisions of Articles I and III, thus treating peaceful nuclear explosives on the same footing as military explosives, and the non-nuclear weapon states were forced to accept this position in order to reach an agreement. Brazil in particular was strongly opposed to this settlement, and many other countries resented it. To compensate for the non-nuclear weapons states having renounced the production of all nuclear explosives, the nuclear powers accepted the introduction of Article V. In this article the nuclear weapon powers pledged to ensure that potential benefits from any peaceful applications of nuclear explosions would be made available to non-nuclear weapons states party to the Treaty. The applications were to be carried out under appropriate international observations and through international procedures.[206]

iii... The West German View

The Federal Republic of Germany, on the other hand, was insisting that a non-proliferation treaty should be concentrated on the prevention of the future spread of nuclear weapons, and that it should not unduly interfere with the peaceful use of nuclear energy. It ought, on the contrary, to stimulate countries in this field. In addition to the danger of industrial espionage and the negative commercial consequences of international safeguards, the Germans feared that, due to the Non-Proliferation Treaty, the non-nuclear weapons states would also be exempt from the

[206]Shaker, ibid., vol. I., pp: 405-430.

so-called spin-offs of military research and development in the nuclear field. The West Germans were reluctant to accept this, pointing out that civilian nuclear research was still young, and that no one knew what the future would hold. And they feared that the Non-Proliferation Treaty would be used to forbid nuclear programmes under the pretext that these would increase the Federal Republic's progress towards nuclear arms.

iv... The Italian View

Within the Eighteen-Nation Disarmament Committee, Italy focused on one aspect in particular, namely the securing of fissile material supply. On 1 August 1967, Italian Foreign Minister, Amintory Fanfani, submitted a proposal concerning the future supply of such materials. He suggested that nuclear weapon powers should commit themselves to transfer a certain amount of fissile material at a reduced price to non-nuclear-weapon states. The material should come from military stockpiles,[207] an idea that had much in common with president Eisenhower's original idea for the setting up of the IAEA. The Italian proposal was never taken up by the chairmen. However, at NATO meetings, the Americans said that nothing could prevent the United States from continuing to supply the EURATOM countries with fissile materials

v... Final Considerations on Peaceful Uses of Atom

The identical draft proposals of August 1967 included for the first time an article on the promotion of the benign use of the atom. The text was taken from the Treaty of Tlatelolco, and confirmed the non-nuclear-weapons states' right to participate in the fullest possible exchange of information concerning civilian nuclear activities. But the demand was for stronger commitments on the part of the nuclear powers. Proposals to this effect was submitted by Nigeria and Italy. Italy was adamant that

[207] Shaker, ibid., vol. I., pp: 304-305.

the Treaty should have concrete reference to the rights to materials and equipment, not only information. Mexico put forward several propositions that were taken into consideration by the chairmen. The most far-reaching changes were introduced in the 11 March 1968 draft proposal and in the final text of the Treaty, negotiated at the United Nations in June 1968. A new preambular paragraph in the March 1968 draft put greater emphasis on the right of the non-nuclear-weapons states to make peaceful uses of nuclear energy, and it was recognised that they should have access to fissile materials.

The final text of 4 June 1968 contained greatly strengthened provisions on the peaceful uses of nuclear energy. Article IV then specified that all parties undertook to facilitate the fullest possible exchange of information. A new provision was added whereby signatories would be "able to acquire source and special fissionable materials as well as equipment for processing, use and production of nuclear material for peaceful purposes". On suggestions from Latin American and African countries, a further clause was added specifying that due consideration should be given to the needs of the developing areas in the peaceful uses of nuclear energy. The formal commitments were confirmed in a statement of the American ambassador. Before the political committee of the General Assembly, the American ambassador pledged that his country would share their knowledge and experience concerning all aspects of the peaceful uses of nuclear energy with the parties of the Treaty. He also mentioned the fact that the American know-how had been acquired at great cost, thereby suggesting that giving such a promise was no small matter in economic terms.[208]

Articles I and II, which defined nuclear spread in the Non-Proliferation Treaty, were on the whole formulated by the three nuclear powers participating in the

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208Forland, ibid., p. 25.

negotiations, and they were formulated in such a way that they suited the interests of these powers, although the United States had to renounce the idea of multilateral nuclear sharing. The final formula would allow for the continuance of the existing military alliances, based as they were on nuclear defence and retaliation. *It was agreed that the Non-Proliferation Treaty would not apply in the case of war.* In such a case, nuclear forces, nuclear weapons and control of nuclear weapons could be transferred to other countries. Furthermore, such a situation could be prepared for in peacetime through transfer of delivery vehicles and control of delivery vehicles, provided that they were not equipped with bombs or warheads.

The American-Soviet understanding meant that the *Non-Proliferation Treaty would also allow for transfer of weapons or control of weapons in the case of a state or an association of states legally succeeding a nuclear-weapon state.* The non-nuclear-weapon states party to the Treaty were strictly forbidden from manufacturing or helping to manufacture weapons or nuclear devices for peaceful purposes. Likewise, the nuclear weapon powers were forbidden from transferring weapons or helping other countries to manufacture nuclear weapons. *Due to the insistence on the part of the most industrialised non-nuclear weapons states, the spread prohibition did not include source or fissile materials and equipment, even in cases where such materials or equipment could have a dual use, i.e. could be used both for civilian and military purposes. Furthermore, the safeguards regime was weakened because of the demand of the EURATOM countries for the preservation of the EURATOM controls system, which did not include control of facilities, only of materials.* Preservation of the EURATOM control regime would also have implication for the choice of inspectors, and this would again have possible implications for the reliability of the safeguards system. At least it would have implications for the principle of international controls. Insistence on the principle of free nuclear development and free nuclear trade in the civilian field led to the inclusion in the treaty of Article IV. This article made it clear that non-nuclear weapon states would have free access to information, materials and equipment for processing, use and production of nuclear materials for peaceful purposes. And not only that, parties to the Non-Proliferation Treaty pledged to facilitate access to relevant information. The Western nuclear powers' acceptance of international control of their civilian nuclear activities was of great political significance for the negotiations, but hardly of importance with regard to preventing spread of nuclear weapons.

CHAPTER VI. THE IAEA SAFEGUARDS DOCUMENT IN CONNECTION WITH THE NUCLEAR NON-PROLIFERATION TREATY: INFCIRC/153.

A... Overview

One important distinction of the Non-Proliferation Treaty is that, with Article III paragraph 1, it requires non-nuclear weapons states to accept full-scope (comprehensive) safeguards on all its source or fissionable nuclear materials. With the same Treaty, the states are also required to conclude a bilateral (or multilateral for groups of states) agreement with the IAEA within a specific period of time. Hence, the more comprehensive nature of the safeguards required under the NPT covering all peaceful nuclear activities of states prompted demands of a number of industrial states with advanced nuclear capabilities that the safeguards system of the IAEA be reviewed considering the broadened scope of the Agency's mandate. Japan and Germany in particular, were very much concerned with the competitive disadvantage in the world nuclear market that the routine and/or special safeguards inspections might cause in their sensitive fuel cycle activities[209] in case they become party to the NPT. To deal with this concern of Japan and Germany, the United States offered to permit the IAEA to apply safeguards to all their nuclear activities except those with direct national security significance.[210] Such voluntary offers were followed by the United Kingdom in 1978, France in 1981, and by the Soviet Union in 1985. In view of Japan and Germany in late 1960s, the international safeguards system represented by INFCIRC/66/Rev.2 lacked sufficient certainty and predictability to ensure against unnecessary intrusiveness, especially with respect to the intensity of safeguards inspection. It was therefore clear that ratification of the Non-Proliferation Treaty by especially these two states was contingent upon the

[209] Such as uranium enrichment, irradiated fuel reprocessing, and development of fast breeder reactors.
[210] This offer took effect in 1980.

establishment of satisfactory safeguards arrangements. Securing the collaboration of these two states was of utmost importance with regard to the survivability of the non-proliferation regime. Hence, the Board of Governors established a committee open to all Agency members to advise it on the Agency's responsibilities in relation to the NPT safeguards provisions and to determine the content of safeguards agreements with NPT parties. The result of this effort, which involved eighty-two committee meetings over a period of ten months, was *The Structure and Content of Agreements Between the Agency and the States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons,* that is, the INFCIRC/153. This document, together with INFCIRC/66/Rev.2 constitute the two basic safeguards documents of the Agency's current safeguards system. The INFCIRC/153, which is the third safeguards document of the IAEA is also usually known as the *model agreement* for the states party to the NPT.

B... Comparison of INFCIRC/66 and INFCIRC/153

INFCIRC/153 was the result of lengthy deliberations in the Safeguards Committee of the IAEA Board of Governors in 1970 and 1971. The document contains many compromises reflecting the divergent requirements of the IAEA member states. In general, INFCIRC/153 sets tight limits on what the IAEA can do, thereby providing protection for states against escalation of safeguards in the future.[211] The two safeguards documents reveal in a way the political environments of their periods that they were being discussed. It may be useful to briefly mention the similarities and differences that these two safeguards documents display.

[211] This had been a matter of considerable concern to a number of non-nuclear weapon states during the course of negotiation process of the NPT safeguards.

i... Similarities

1... both safeguards documents envisage similar methods and practices in safeguards implementation;

2... both documents rely on records, reports, and design information to establish the strategies for the actualization of safeguards;

3... in both documents, on-site inspections are essential for achieving independent inspections so as to verify that the states do comply with their undertakings;

4... in both INFCIRC/153 and INFCIRC/66, it is well defined that during the course of conducting on-site inspections the Agency will not hamper facility operations or impede peaceful nuclear developments of the states inspected;

5... both documents emphasize that the Agency will employ prudent management practices, and will not disclose confidential information obtained by the Agency.

ii... Differences

1... Under the INFCIRC/66 safeguards system of the IAEA, the purpose of safeguards is to ensure that safeguarded material is not used in such a way as to further any military purpose. Under the INFCIRC/153, however, the manufacture of nuclear weapons is prohibited. Other military uses of nuclear energy, such as propulsion of military vessels or vehicles, are not prohibited under the INFCIRC/153. On the other hand, the NPT prohibits a non-military activity, namely the manufacture of nuclear explosive devices for peaceful purposes, which would not be prohibited under INFCIRC/66 type IAEA safeguards procedures.

2... Another important difference between the INFCIRC/66 type IAEA safeguards and the safeguards envisaged in Article III.1 of the NPT, is that the former apply to specific nuclear facilities or to specific amounts of nuclear material, whereas the latter shall be applied on all source or special fissionable material in all peaceful nuclear activities within the territory of the state in question, or under its jurisdiction or carried out under its control anywhere. That is the INFCIRC/153 type safeguards agreements are comprehensive (full-scope).

3... Furthermore, the differences between INFCIRC/153 and INFCIRC/66 are also reflected in a number of new concepts introduced as elements of the NPT safeguards document in order to improve the acceptability and effectiveness of safeguards which can be commensurable with the broadened mandate of the IAEA under the NPT. Among these new concepts are:

.) formal provisions for subsidiary arrangements;

.) emphasis on focusing safeguards on strategic points;

.) use of instrumentation and other non-human inspection techniques where feasible;

.) explicit recognition of surveillance and containment as important complementary measures to material accountancy;

.) a requirement that the safeguarded state establish a national system of accounting for and control of nuclear material;

.) the regulation of the intensity of routine inspection.

C... Objective of IAEA Safeguards Pursuant to INFCIRC/153

Safeguards are the technical means that the IAEA employs to verify compliance of the states with their legal obligations not to acquire nuclear weapons. Put in this context, *the political objective of verification is to deter against possible diversion through the risk of early detection.* To complement with this political objective, the technical objective of the IAEA verification procedures is "the timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection."[212] Thus, *the IAEA's verification system is geared to ensure that any diversion of significant quantities of fissile material to military purpose has to be discovered 'in time' before it is converted into a bomb.*[213] Furthermore, the same paragraph mentions "for purposes unknown", which indicates that the Agency does not have to seek to determine the use to which diverted material is put, nor to prove that diverted material is being used for the manufacture of nuclear weapons or other nuclear explosive devices. What falls on the Agency is to conclude that the diverted material cannot be accounted for, that is to record that amount in the report indicating the material unaccounted for.

Though, in paragraph 28 of INFCIRC/153, the key terms *timely detection, significant quantity,* and *the risk of early detection* are indicated as the technical objectives, they are nonetheless conceptual in nature and they do need to be translated into operational terms by assigning them quantitative measures. Of these terms, timely detection is quantified by relating specified nuclear materials, such as highly enriched uranium (HEU), plutonium, or thorium, to the time necessary to convert material in specified form into metallic components suitable for use in nuclear explosive devices. Significant quantity, on the other hand, is the approximate amount of nuclear material which the IAEA considers a state would need to manufacture its first nuclear explosive device. In defining such quantities, the IAEA takes into account matters such as the degree of enrichment of the material and any process that may be needed to convert it into a nuclear explosive. This amount is generally accepted as approximately equal to 8 kg. of plutonium (P-239) or 25 kg. of highly enriched uranium (U-235). Finally, by the risk of early detection, the Agency

[212] INFCIRC/153, paragraph 28.
[213] In case of Plutonium and highly enriched uranium (HEU) in metal form, the conversion takes seven to ten days. So, the need for frequent and timely inspection, and challenge inspection in some cases, is clear. See, in these respects, Mohammed El Baradei, *IAEA Verification : Basic Features and Recent Developments*, Paper submitted to the International Atomic Energy Agency Workshop on the Modalities for the Application of Safeguards in a Future Nuclear-Weapon-Free Zone in the Middle East, 4 - 7 May, 1993.

aims at a detection probability of 90 - 95 percent and a false alarm probability of 5 percent or less. Both of these numbers are derived from statistical probability and not an objectively defined rationale. The values assigned to the notions of significant quantity and timely detection have been adopted by the IAEA Board of Governors as guidelines for inspection planning and detection goals. A group of experts advisors, namely the Standing Advisory Group on Safeguards Implementation (SAGSI) established within the IAEA, assisted the Board in dealing with problems associated with translating principles and procedures of INFCIRC/153 into operationally effective and acceptable forms.

D... Basic Tenets of IAEA Safeguards Pursuant to INFCIRC/153

The IAEA's third safeguards document INFCIRC/153 consists of three parts. Part I sets forth the general principles governing the rights and obligations of the parties to the safeguards agreements under the NPT. The parties to a safeguards agreement are the states or group of states on the one side, and the IAEA on the other. The general principles of Part I include: the basic undertaking; application of safeguards; implementation of safeguards; provisions of information to the Agency; procedures about the Agency inspectors; legal and financial responsibilities; measures that can be taken by the Agency in an effort to ensure verification of non-diversion; rules for interpretation and settlement of disputes, and related matters.

Part II of INFCIRC/153 spells out these principles that are translated into operational arrangements and the provisions that are deemed necessary to implement safeguards, such as the starting point of safeguards; termination of safeguards; exemptions from safeguards. The Part II also includes a statement of the technical objective of safeguards; materials to be taken under the scope; measures such as material accountancy; containment & surveillance; and the methods to be used such as design review; records system; reports system; inspections; and international transfers.

Part III of INFCIRC/153 consists of definition of key terms and concepts such as annual throughput; book inventory; physical inventory; effective kilogram; enrichment; facility; key measurement point; man-year of inspection; material balance area (MBA); material unaccounted for (MUF); nuclear material; shipper/receiver difference; and strategic points that appear in the principles and operational procedures sections of the document. The implementation of the safeguards document INFCIRC/153 requires the negotiation of three instruments, namely the Safeguards Agreement, Subsidiary Arrangements, and Facility Attachments which include a Design Information Questionnaire. The Safeguards Agreement establishes the basis for the application of Agency safeguards.

i... Subsidiary Arrangements

Subsidiary Arrangements specify the details of safeguards implementation according to the general principles in the Safeguards Agreement. They define what information the IAEA will require to meet its safeguards obligations, establish a format for record-keeping, and delineate the safeguards arrangements to be carried out at each facility. Subsidiary arrangements also include the Facility Attachments which contain definitions of the Material Balance Areas (MBA), the Strategic Points and the Key Measurement Points at which safeguards will be applied; the Containment and Surveillance Measures to be applied; the format and timing of reports to be submitted to the Agency; and the mode, timing and the extent of the Agency inspections at the facilities of the States to be inspected.

The essential aim of the Subsidiary Arrangements is to permit standardization of safeguards implementation as well as preserving confidential information acquired by the inspectors during the courses of inspections. These arrangements are negotiated between the Agency and the states parties to the NPT, and are not imposed by the Agency on the state to be inspected, nor are they submitted to the approval of the Board of Governors. The content of the Subsidiary Arrangements are kept secret by the parties to the agreement. Theoretically, the Subsidiary Arrangements are likely to accommodate developments in the instruments and technologies used in safeguards implementation. The paragraph 39 of INFCIRC/153 provides for the possibility of changing the Subsidiary Arrangement by agreement between the state and the Agency without need to amend the Safeguards Agreement itself. However, since many crucial and sensitive elements of actual safeguard arrangements are established in the Subsidiary Arrangements, including the definition of strategic and key measurement points and the designation of actual routine inspection efforts at different facilities, it is somewhat unclear whether modifications and adjustments can be readily achieved.[214]

ii... Strategic Points

One important feature of the safeguards system is the declaration of nuclear materials at the disposal of the states party to the NPT. Therefore, an inventory of presumably all nuclear materials has to be declared so that the IAEA can make sure during successive inspections that these materials remain in peaceful uses. Hence, the Agency makes sure through three sets of measures, namely:

1... material accountancy;

2... containment & surveillance;

3... on-site inspections.

[214]The difficulties experienced in seeking to alter earlier safeguards agreement with Pakistan (not party to the NPT) under INFCIRC/66 regarding the application of surveillance equipment at the Kanupp reactor suggest that agreement to change may be much more difficult to achieve than normally believed. L. Scheinman, ibid., p. 155. For a detailed discussion of this case, see David Fischer and Paul Szasz, *Safeguarding the Atom: A Critical Appraisal*, London, Taylor and Francis, 1985, pp: 16 - 17.

Material accountancy is simply counting the initially declared materials at pre-determined material balance areas. The purpose of counting the materials is to determine the material unaccounted for the quantity of which may be alarming for some 'unwanted' uses of the materials under safeguards. Due to several reasons some negligible amounts of nuclear materials may be lost, or not be present at the material balance areas at the time of inspection. However, so long as the material unaccounted for (the difference between the book inventory and physical inventory) remains to be negligible, it does not create problems between the states and the Agency.

Material balance areas are mostly referred to as strategic points indicated in the Facility Attachment. In INFCIRC/153 strategic points are defined as the location where, under normal conditions, and when combined with the information from all strategic points taken together, the information necessary and sufficient for the implementation of safeguards measures is obtained and verified.[215] The principle of safeguarding the flow of fissionable material at certain strategic points did not originate with INFCIRC/153. It had surfaced earlier at the initiative of the Federal Republic of Germany in 1967 when the IAEA Board of Governors was considering the extension of Agency safeguards to conversion and fabrication facilities as mentioned in INFCIRC/66/Rev.2. Interest in the strategic points approach partly reflected concern that safeguards be cost-effective and efficient, and that the risk of exposure of proprietary information be kept to a minimum. It also bespoke a desire to make safeguards as non-intrusive and non-visible as possible. The same concerns explain the parallel emphasis on introducing instrumentation *in lieu of* human inspection wherever feasible. Strategic points are justifiable as a basis for efficient,

[215]It is also provided that in implementing safeguards the Agency shall make every effort to ensure the application of the principle of safeguarding effectively the flow of nuclear material subject to safeguards by use of instruments and other techniques at certain strategic points to the extent that technology permits. See, INFCIRC/153, paragraph 6.

standardized safeguards approaches, and they are logically consistent with the concept of material balances, which is the primary method used in international safeguards. They offer a rational approach for dealing with the IAEA's augmented safeguards responsibility by emphasizing the concentration of safeguards effort where material is most accessible. Strategic points are selected in connection with material balance determination rather than with the physical movement of material. However, since those points are selected with a view to the ease of determining the movement and transfer of nuclear material, they often relate to places where material is relatively accessible.

With paragraph 76c of INFCIRC/153, during the routine inspections the access of the IAEA inspectors are limited to the strategic points specified in the Subsidiary Arrangements. This is a contradictory application to what has been defined in the Article XII.A.6 of the Statute as that *the inspectors shall have access at all times to all places and data and to any person.*[216] The normal basis for the selection of strategic points is by review of design information made available to the Agency by the state. Paragraph 47 of INFCIRC/153 provides that the selection of strategic points should be re-examined in the light of changed operating conditions, safeguards technology developments, or experience in the application of verification procedures. However, since concluding an agreement on the Subsidiary Arrangements requires the consent of the states to be safeguarded, re-examination these arrangements pertaining to the strategic points and instrumentation can be a result of mutual agreement. All in all, the strategic points provide certainty, predictability, and specificity, and therefore enhance the objective of improving safeguards acceptability.

[216] It should be noted once again that while on the one hand application of safeguards are compulsory and full-scope under the Non-Proliferation Treaty provisions, on the other hand, states are rather free to accept safeguards or not, according to the terms of the IAEA Statute, based on the criteria as whether they have acquired any Agency assistance or assistance of any state that strictly requires safeguards.

iii... Containment & Surveillance

The only safeguards technique that the IAEA's second safeguard document INFCIRC/66 explicitly covered is material accountancy, that is material measurement, records, reports and verification of the data involved to determine whether material subject to safeguards is accounted for. In practice, material accountancy is often supplemented by containment and surveillance measures. INFCIRC/153, however, explicitly incorporates containment and surveillance as important complementary measures to material accountancy. Paragraph 74(d) of INFCIRC/153 identify containment and surveillance as measures that should be used for the purpose of fulfilling inspection responsibilities of the Agency.

Containment and Surveillance provide information on movements of nuclear material. These measures can be applied to the flow or inventory verification to ensure that each item is inventoried without duplication, and the IAEA instruments, devices, working papers and supplies are not tampered with. For containment purposes physical barriers are used (e.g., walls, containers, vessels etc..) which in some way physically restrict the movement of, or access to information related to the quantities or the location of nuclear material, and to the IAEA surveillance devices such as automatic cameras and video tape recorders. Accordingly, on-site inspections are performed to take measurements, to change camera films, and to apply seals to contained materials.[217] Containment and surveillance measures are coming to be regarded as increasingly necessary with respect to effective safeguarding bulk handling facilities. These facilities have large throughputs of accessible nuclear material, and material accountancy measures cannot provide the desired timeliness of detection of diversion. But they are less amenable to quantification than are measures of material accountancy, and hence it has been

[217]Since the IAEA is 'solely' mandated to inspect and report, one should not expect further performance, such as acting as an international police force to 'arrest' suspected or actual violators. 'Use of force' is beyond its scope.

difficult to arrive at quantified safeguards outcome statements. Even in the case of INFCIRC/153 with its explicit inclusion of containment and surveillance, the application of such measures is negotiated between the Agency and the state, and incorporated in Subsidiary Arrangements which needs the mutual agreement for any amendments.

There are significant differences in the safeguards community over the role containment and surveillance can play. The argument against considering containment and surveillance as anything more than a supplement to material accounting is that, paragraph 30 of INFCIRC/153 states that the product of safeguards is the material balance statement and that containment and surveillance cannot provide such a statement. It is also argued that containment and surveillance could not detect a diversion apart from a determination by accounting that material was missing and could not be otherwise accounted for. In this view, the most that the containment and surveillance measures can do is to support accounting by providing confidence that flows and inventories were counted and counted only once, and to preserve measurements with material in sealed containers. But, in this view, containment and surveillance cannot be an alternative to accounting, and cannot provide precision of findings or timeliness of detection beyond what accounting can provide.[218]

iv... State System of Accounting and Control (SSAC)

An important feature of the NPT safeguards document that distinguishes it from the previous IAEA safeguards documents is the requirement that states party to the NPT establish and maintain a national system of accounting for and control of nuclear material.[219] The inclusion of such a requirement reflected practical and

[218]See, L. Scheinman, ibid., pp: 163 -171.
[219]INFCIRC/153, paragraph 7.

political considerations. Practically it was not feasible for the IAEA to run a self-sufficient accountability system and to directly verify all flows and inventories. Although INFCIRC/66 does not require the establishment of state systems, it does call for agreement between the IAEA and the state on a system of records and reports. Virtually all states with significant nuclear activities have instituted control arrangements because of the value and hazardous nature of the materials in question, and the IAEA has made use of the records and reports generated under those systems.

The NPT safeguards document INFCIRC/153 sets forth the basic elements that should be included in a state system of accounting and control in order to provide a basis for the application of the Agency safeguards. INFCIRC/153 calls for the establishment of :

1... a nuclear materials measurement system;

2... procedures for taking physical inventories;

3... a system of records and reports;

4... procedures for submitting reports to the IAEA.

The intensity of the Agency's safeguards efforts are closely linked to the quality and the technical effectiveness of the state system of accounting and control. In other words, the closer the SSACs are in form and operation to measures recommended by the safeguards document, the less intensive the safeguards measures the IAEA would deem it necessary to impose. The Agency verifies the findings of the state's control system while maintaining and implementing the right to make its own independent measurements and observations, and to supplement information provided by the state to assure itself that diversion has not taken place and that safeguarded materials are accounted for. Thus, whatever the technical effectiveness of SSACs, they do not qualify as substitutes or alternatives to IAEA safeguards. They are an integral part of the IAEA safeguard concept, but separate and distinct from the operational system directly controlled by the Agency.

The political considerations related to the provisions for national accounting and control systems are largely concerned with the issue of how to minimize the intensity of Agency's safeguarding activities. INFCIRC/153 states that, in its verification the Agency "shall take due account of the technical effectiveness of the State's system."[220] Similarly, the paragraph 31 of the same safeguard document reiterates the same advice, which also calls on the Agency to avoid unnecessary duplication of state's accounting and control activities. The provisions dealing with determining the actual number, intensity, duration and mode of routine inspections of any facility asserts that one of the criteria to be considered is the effectiveness of the State's accounting and control system including the extent to which the measures previously specified have been implemented by the state.[221]

v... Intensity of Routine Inspections

IAEA's safeguards inspections are the most sensitive issues associated with the safeguards system of the Agency. Since, the sovereign rights of the states to be inspected are, in a way, undermined because of the supranational rights conferred to the IAEA under the terms of the Article III of the Non-Proliferation Treaty. The same holds true for the Statute of the IAEA which gives the Agency broad rights of "...access at all times to all places and data..." provided a state acquires Agency assistance, or a supplier state asks for Agency safeguards as a pre-requisite for assistance, or the state itself asks voluntarily for the application of Agency safeguards. INFCIRC/66 somewhat diluted that sweeping right of access at all times to all places by providing in paragraph 47 of that document that "the number,

[220]INFCIRC/153, paragraph 7.
[221]INFCIRC/153, paragraph 81.

duration and intensity of inspections actually carried out shall be kept to the minimum consistent with the effective implementation of safeguards..." To further define inspection intensity, INFCIRC/66/Rev.2 established a scale of maximum routine inspections based on effective kilograms of nuclear material in the safeguarded facility or its inventory, and in the case of reactors, the document specified several criteria for guiding actual routine inspection frequency. Similarly, the NPT safeguards document INFCIRC/153 establishes the maximum routine inspection effort for designated categories of facilities or other locations of nuclear materials.[222] Based on the quantity of nuclear material involved, the document specifies the number of man-days of inspection per year that is applicable to each designated category, leaving the Agency to decide how to deploy that aggregated effort among the different facilities in each category in the safeguarded state.

The actual routine inspection effort, which in practice is agreed, is to be determined in light of mainly four criteria spelled out in paragraph 81 of the NPT safeguards document.[223] Three of these four criteria are straightforward. These are:

1... the form of the nuclear material under control;

2... the characteristics of the state's nuclear fuel cycle;

3... the technical developments in safeguards.

4... a fourth criterion relating to the effectiveness and dependability of the state system of accounting and control (SSAC) is, however, dependent upon subjective judgements and interpretations.[224]

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[222]INFCIRC/153, paragraph 80.

[223]An agreement is to be reached by negotiating on a facility-by-facility basis between the state and the IAEA and by including in the Subsidiary Arrangements.

[224]The importance of these criteria is that they create a basis upon which the Agency can exercise some flexibility in the application of safeguards and differentiate among situations in a somewhat standardized manner. According to Lawrence Scheinman, the Agency is not always able to fully protect its independence when it comes to implementation, since states have insisted on specifying the actual routine inspection effort in Subsidiary Arrangements, although this was not the intent of the NPT safeguards document, thereby placing further real or psychological boundaries on Agency discretion. See, L. Scheinman, ibid., p. 162.

E... Weaknesses of the Safeguards Document INFCIRC/153

One important weakness of the IAEA verification procedures is that, the Agency is enabled to apply its safeguards only to *declared* facilities. Therefore, whatever declared by the states makes up the 'agenda' of the IAEA for that state. But, the disclosure of the nuclear weapons programme of Iraq has very well revealed that it is possible to conduct clandestine activities in undeclared facilities 'free' from the risk of detection.[225] Therefore, information is an essential ingredient to the proper functioning of verification provisions.[226] From a legal standpoint, the INFCIRC/153 states that, the Agency has an obligation to ensure that safeguards are applied to all nuclear material in peaceful activities. The Agency has to make sure that all measures are undertaken not only to ensure that declared activities are under safeguards, but that there are no undeclared activities at all. To overcome such difficulties, the IAEA Board of Governors, with the experience gained in Iraq, developed a comprehensive data-base, and thus embarked on the establishment of a scheme for reporting to the Agency all exports and imports of nuclear material, even if intended for non-nuclear use, as well as the export and the import of specified equipment and relevant non-nuclear material for nuclear use. As another consequence of the Iraqi experience, the Agency's right to access to non-declared sites under paragraphs 73 and 77 of the INFCIRC/153 is confirmed. The Agency is entitled to draw on all available information, including data submitted by individual member states. States are obliged to inform the IAEA about all plans for the construction of nuclear facilities and to submit early design information. Needles to say, such an interpretation and practice of the paragraphs 73 & 77, are important steps for further effectiveness of the non-proliferation regime. Expectedly, another measure has been the establishment of a dynamic relationship between the Agency

[225]Unless, as ironically argued, such events like the 'Gulf War' occur.

[226]The lack of full information and its adverse effects have, indeed, long been debated both in scholarly writings, and among the IAEA authorities, on the grounds whether the Agency should have its own intelligence gathering unit, or not. But no concrete outcomes seem to have come about.

and the United Nations Security Council, to provide its full endorsement as 'another' deterrent towards the states that may opt to go nuclear. Hence, some features of the UN Security Council Resolution 687, such as unlimited access to records, overflight rights, and environment sampling (water, air) may promise considerable improvements in the safeguards arsenal in the future if they could be incorporated in routine safeguards.[227] However, it's not clear how the IAEA will fulfill its duty concerning undeclared facilities in other countries as they arise problematic. Having briefly touched upon in this paragraph the major weaknesses of nuclear verification under the NPT in general, and shortcoming of IAEA safeguards inspections underINFCIRC/153, the Part IV of this study will deal with the same matters in more detail and will accordingly investigate what measures are being taken and what else are still needed to overcome the obstacles on the way to proper functioning of the nuclear non-proliferation regime.

[227]Eric Chauvistré, *The Implications of IAEA Inspections under Security Council Resolution 687*, New York, United Nations, UNIDIR Research Paper 11, 1992.

PART III

REGIONAL NUCLEAR NON-PROLIFERATION AGREEMENTS AS AUXILIARY ELEMENTS OF THE NON-PROLIFERATION REGIME

CHAPTER VII. THE NUCLEAR-WEAPON-FREE ZONES & THE ZONES OF PEACE

A... Concept of Nuclear-Weapon-Free Zones

The concept of nuclear-weapon-free zone (NWFZ) was developed predominantly upon the desire of totally eliminating nuclear weapons from various parts of the globe. The principal aim has been to spare the nations concerned from the threat of nuclear weapons. Hence, the promotion of total and effective nuclear disarmament, was believed to be the best means to preserve international peace and security. The concept has initially stemmed from the circumstance that, in the aftermath of the "atoms for peace" proposal, once espoused by the US President Eisenhower, a number of states in different parts of the world could 'go nuclear' and acquire the necessary technology and material to build their bomb indigenously. Hence, this produced a spill-over effect whereby many other countries felt the urge to do the same, due to the threat of the existence of such weapons in their very neighbourhood. In such circumstances, *nuclear-weapon-free zones were thought to provide necessary means, among others, to avert nuclear proliferation and to halt the arms race.* Beyond the risks it caused in political and military terms, the arms race had severe economic repercussions. Thus, an important benefit of these zones could be the creation of a framework for regional cooperation, particularly in the peaceful uses of nuclear energy.

The practicality of a zonal agreement rests on the willingness and readiness of the states concerned. To this end, states must be convinced that their vital security interests will be enhanced and not jeopardized by participating in a nuclear-weapon-free zone. Particularly in such regions where a state is believed to hold nuclear weapons, the mere existence of such weapons is enough to threaten the security of all the region, not excluding the possessor (or the deployer) of the weapon.

Therefore, national security interests must concur with the regional security interest. Thus all the states must lean towards the creation of such zones.

A generalization can hardly be made with regard to the rules and procedures of a nuclear-weapon-free zone, because of the political, economic, military, geographical, and cultural differences between the regions (and even between the states within a specific region). But one can safely state the following general principles and objectives of nuclear-weapon-free zones:

a...obligations relating to the establishment of such zones may be assumed not only by a group of states, including entire continent or large geographical regions, but also by smaller groups of states and even individual countries;

b...nuclear-weapon-free zone agreements must ensure that the zone would be, and would remain, effectively free of all nuclear weapons;

c...the initiative for the creation of a nuclear-weapon-free zone should come from states within the region, and participation must be voluntary;

d...whenever a zone is intended to embrace a region, the participation of all militarily significant states, and preferably all states in the region would enhance effectiveness of the zone;

e...the zone arrangements must contain an effective system of verification to ensure full compliance with the agreed obligations;

f...the arrangements should promote the economic, scientific and technological development of the members of the zone through international cooperation and all peaceful uses of nuclear energy;

g...the treaty establishing the zone must be of unlimited duration.[228]

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[228]See the *Comprehensive Study on the Question of Nuclear-Weapon-Free Zones in all its Aspects*, Special Report of the Conference of the Committee on Disarmament, New York, United Nations publication, 1976, Sales no: E. 76.I. 7, (A/10027/Add.1) pp: 31-32. For further elaborations on nuclear-weapon-free zones and their implications for different regions of the world see, Jozef Goldblat, 'Nuclear-Weapon-Free Zones : Lessons From Existing Agreements', in Darryl Howlett & John Simpson (eds.), *East Asia and Nuclear Non-Proliferation*, Papers from the Twelfth PPNN Core Group Meeting, Japan, 1992.

In addition to these principles one can equally state several general objectives of the establishment of an NWFZ. These are to:

a...spare the zonal states from the use or threat of use of nuclear weapons;

b...contribute to the prevention of horizontal proliferation of nuclear weapons, as well as to limit a wider geographical deployment by the nuclear-weapon powers;

c...strengthen confidence and improve relations among zonal states;

d...contribute to regional and world stability and security and to the process of disarmament, in particular nuclear disarmament;

As far as the nuclear-weapon-free zones are concerned, the earliest examples are the Rapacki Plan of 1957, the Tito Plan of 1958 and the Kekkonen Plan of 1963, in Europe; the United Nations General Assembly Resolution 1653/XVI of 1961, and the Organization of African Unity's Heads of States and Governments Declaration of 1964 on the Denuclearization of Africa; and the Five Presidents' Declaration (Bolivia, Brazil, Chile, Ecuador and Mexico) of 1963 on the Denuclearization of Latin America.

i... The Antarctic Treaty

The Antarctic Treaty of 1 December 1959 was the first international agreement as a treaty establishing a demilitarized zone which contained by implication provisions to ensure that nuclear weapon states would not be introduced into an area. In 1959, governmental representatives of the 12 countries[229] participating in the International Geophysical Year in Antarctica met in Washington D.C. to conclude a treaty that would ensure the use of Antarctica for peaceful purposes and the continuity of cooperation in scientific research in this area. The Treaty was not intended to solve the problem of different territorial claims, which covered approximately 80 percent of the whole continent, but rather to ensure the access to

[229]These countries were: Argentina, Australia, Chile, France, New Zealand, Norway, the United Kingdom (all seven of them had territorial claims on Antarctica) and Belgium, Japan, South Africa, the United States, and the Soviet Union.

all the regions of Antarctica to carry out scientific research and to prevent undesirable political rivalries by maintaining the *status quo* in regard to the territorial claims. Article I of the Treaty stipulates that Antarctica shall be used exclusively for peaceful purposes and prohibits any measure of military nature. Article II aims at promoting freedom of scientific investigation and cooperation toward that end. Article V, on the other hand, prohibits any nuclear explosions and disposal of radio-active waste in the Continent. The Treaty created a system of control based on national technical means of verification, carried out by observers nationals designated by the contracting parties. The Treaty also provides the right of aerial observation at any time over any of the regions of the Continent, and the observers have full access at any moment to any area or installations, and to all ships and aeroplanes at points of discharge and embarkation.[230] This was a highly intrusive verification mechanism for the standards of the time, and no violations of the Treaty have been reported, attesting both to its effectiveness and to the good conduct of the parties.[231]

ii... The Latin American Nuclear-Weapons-Free Zone: Treaty of Tlatelolco

The Treaty for the Prohibition of Nuclear Weapons in Latin America, namely the Tlatelolco Treaty which was opened to signature on 14 February 1967, is the only instrument so far to establish a nuclear-weapon-free zone in a densely inhabited geographical setting. The agreement also led to the creation of one of the first agencies for Latin American collective action. Such action was facilitated by the

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[230]see the *Comprehensive Study on the Question of Nuclear-Weapon-Free Zones* ... , p.10. For additional information and comments see, Gilles Cottereau, The Antarctic Treaty (1959), in Serge Sur (ed.), *Verification of Current Disarmament and Arms Limitation Agreements: Ways, Means and Practices*, Aldershot, Dartmouth, 1991, pp: 67 - 94.

[231]A principal reason for making such constraints possible in those years of relentless arms race might stem from the fact that the area of application of the Treaty was not in the immediate reach of the home-lands, thus constituted a less sensitive issue, both militarily and politically. All the nuclear weapon states agreed on limiting their freedom of naval and military deployment in exchange for participation in the peaceful scientific cooperation in Antarctica. Being aware that such limitations were applicable to all of those party to the Treaty, the parties submitted their ratification in a very short time.

uniqueness of Latin America as a group of independent states sharing a common history and culture. And it was precisely this characteristic that made Latin America particularly suitable for the establishment of a "nuclear-free zone".[232] The Treaty is also the first agreement on arms limitation, disarmament and collateral disarmament measures to establish an effective system of control under a permanent supervisory organ, namely OPANAL.[233] The Treaty, which comprises a Preface, 32 Articles, and two Additional Protocols, defines the terms territory and nuclear weapon; establishes an international agency to ensure compliance with the Treaty, together with a control system which includes the application of IAEA safeguards to all nuclear activities of the contracting parties - reporting, inspection, observation of peaceful nuclear explosions, and exchange of information. The Treaty further provides for the development of peaceful uses of nuclear energy; envisages relations between OPANAL and other international organizations; and establishes measures in the event of violations of the Treaty.[234]

The Tlatelolco Treaty also stands as an essential element of the nuclear non-proliferation regime and brings several contributions to the regime that are not found in the Non-Proliferation Treaty. First, the Treaty of Tlatelolco is of a permanent nature and

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[232]An alternative conceptual approach for the Latin American zone comes from Monica Serrano who prefers to call this zonal arrangement a "nuclear-free zone" (NFZ). See, Monica Serrano, *Common Security in Latin America: The 1967 Treaty of Tlatelolco*, University of London, Institute of Latin American Studies, Research Papers, 1992.

[233]Agency for the Prohibition of Nuclear Weapons in Latin America. OPANAL comprises the three principal organs, namely a General Conference, a Council, and a Secretariat, and subsidiary organs as considered by the General Conference. The General Conference is composed of all the Contracting Parties and holds regular sessions every two years. The Council consists of five Members elected by the General Conference among the Contracting Parties, due account being taken of equitable geographical distribution. The Members of the Council are elected for a term of four years. The Secretariat consists of a General Secretary, who is the chief administrative officer of the Agency, and of such staff as the Agency may require. The term of office of the General Secretary is four years and he may be re-elected for a single additional term. The General Secretary may not be a national of the country in which OPANAL has its headquarters. For further information in this regard see, Dr. Antonio Stempel Paris, Secretary-General, OPANAL, *The Treaty for the Prohibition of Nuclear Weapons in Latin America*, paper submitted to the IAEA Workshop on the Modalities for the Application of Safeguards in a Future NWFZ in the Middle East, in Vienna, Austria, 4-7 may, 1993.

[234]See the *Comprehensive Study on the Question of Nuclear-Weapon-Free Zones ....*, p. 13.

shall remain in force indefinitely. Secondly, the Treaty does not allow stationing of nuclear weapons anywhere in its zone of application, whereas, the NPT permits nuclear weapons to be deployed on a non-nuclear weapons states as long as they are under the control of nuclear weapons states that owns them. Third, the Treaty does not differentiate between nuclear weapons states and non-nuclear weapons states, since there are no nuclear weapons states in Latin America. Fourth, the Tlatelolco Treaty introduced a novel approach to enforcement that differs from the approach provided in the NPT. Accordingly, *the Treaty of Tlatelolco provides that signatories may demand inspection of another Treaty party's nuclear facilities at any time and requires that the signatories cooperate fully with the inspection.* These special inspections are frequently referred to as challenge inspections. Whereas, the NPT's special inspections are initiated by the IAEA rather than at the request of another Treaty party, and must be negotiated with the Member-State suspected of violating its NPT obligation.[235]

In Article 15 of the Treaty of Tlatelolco it is agreed that, "At the request of any of the Contracting Parties and with the authorization of the Council, the General Secretary may request any of the Contracting parties to provide the Agency [OPANAL] with complementary or supplementary information regarding the extraordinary event or circumstance which affects the compliance with this Treaty, explaining his reasons." Consequently, with Article 16 "At the request of any of the Contracting Parties and in accordance with the procedures established in Article 15 of this Treaty, the Council may submit for the consideration of the International atomic Energy Agency a request that the necessary mechanism be put into operation to carry out a special inspection." Article 12 defines the scope for verification which includes inspection of devices, services and facilities intended for

[235]For further comments in this regard see, Garry T. Gardner, *Nuclear Nonproliferation: A Primer*, Boulder, Lynne Rienner Publishers, 1994, pp: 59 - 60.

peaceful uses of nuclear energy, so as to ensure that none of the activities prohibited in Article 1 are carried out. Article 16 and 20 provide a number of mechanisms to prevent violations of the agreement.[236]

One principal weakness of the Treaty of Tlatelolco is said to be the ambiguity surrounding the treatment of peaceful nuclear explosions (PNE). The permission to conduct PNE is embodied in Article 18 stating that the Contracting Parties "may carry out explosions of nuclear devices for peaceful purposes - including explosions which involve devices similar to those used in nuclear weapons - or collaborate with the third parties for the same purpose, provided that they do so in accordance with the provisions of this article and the other article of the Treaty, particularly articles 1 and 5." As Serrano observed, there have been some conflicting interpretations of the terms of the Article asserting that, the definition of "nuclear weapon" in Article 5 was loosely written, and thus the resulting PNE were incompatible with the spirit of the Treaty.[237] An interesting note in this regard is that, prior to the most recent adherence of Argentina and Brazil to the Treaty of Tlatelolco in 1994, they have jointly disavowed, in 1991, their previous policy favouring so-called peaceful nuclear explosion. Argentine-Brazilian acceptance of the view that there is no meaningful distinction between peaceful and military nuclear explosions had two important results. First, it eliminated any domestic policy justification for a testing program and, second, it symbolically separated Argentina and Brazil from India's international posture of PNE advocacy.[238]

An important feature of the Tlatelolco Treaty is that, with two additional Protocols (I & II), it prescribes the basic undertakings of the extra-zonal states.

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[236]See Monica Serrano, ibid., pp: 43 - 44.
[237]Ibid.,
[238]See, John R. Redick, Julio C. Carasales, and Paulo S. Wrobel, "Nuclear Rapprochement: Argentina, Brazil, and the Nonproliferation Regime", *The Washington Quarterly*, Winter 1995, 18:1, pp: 107 - 122.

According to Protocol I, extra-zonal states which *de jure* or *de facto* are internationally responsible for territories lying within the zone would "undertake to apply the statute of denuclearization in respect to warlike purposes as defined in Articles, 1, 3, 5, and 13 of the Treaty" to such territories. As to Protocol II, nuclear-weapon states are required to respect the statute of denuclearization as provided in the Treaty and to "undertake not to use or threaten to use nuclear weapons against the contracting parties." All the five nuclear-weapon states have ratified the Protocol II, this constitutes a legally binding commitment of negative security assurances undertaken by them.[239]

iii... The South Pacific Nuclear-Free Zone: Rarotonga Treaty

The Treaty was opened to signature in 1985, declares the creation of a South Pacific Nuclear-Free Zone encompassing Australia, New Zealand and several small South Pacific island nations. The Rarotonga Treaty contains prohibition of the acquisition of nuclear weapons, similar to that provision found in the other major nuclear non-proliferation treaties. It also prohibits the testing or deployment of nuclear weapons, and the dumping of nuclear wastes anywhere in the South Pacific. The most significant difference between the Rarotonga Treaty, and the NPT or the Tlatelolco Treaty, is the strict safeguards requirement. Hence, the Treaty requires full-scope (comprehensive) safeguards on the peaceful nuclear activities and nuclear exports of all non-nuclear weapons states party to the Treaty. On 20 October 1995, France, the United Kingdom, and the United States announced that they will sign the protocols of the Roratonga Treaty. This means that the South Pacific will really become a NWFZ. France also announced that it will close its test site in Muroroa after completing its series of nuclear test. [240]

[239] See Edmundo Fujita, *The Prevention of Geographical Proliferation of Nuclear Weapons: Nuclear-Weapon-Free Zones and Zones of Peace in the Southern Hemisphere*, New York, UNIDIR Research Paper No: 4, 1989, p. 26.
[240] See for details, *PPNN Newsbrief*, No: 32, 4th Quarter 1995, p. 2.

iv... The African Nuclear-Weapon-Free Zone: Pelindaba Treaty

The African Nuclear-Weapon-Free Zone has been an issue on the political agenda, since the French nuclear test in Algeria in 1964 which prompted the Organization of African Unity (OAU) to adopt that year a declaration calling for the permanent denuclearization of Africa. Since then, the UN General Assembly has adopted a resolution every year calling upon all states to respect the continent of Africa as an NWFZ. This resolution also condemned the steps taken by South Africa to acquire nuclear weapon capacity. Since, until the official declaration in 1993 that South Africa had developed six nuclear weapons, the uncertainty surrounding the nuclear activities of that state and its refusal to join the non-proliferation regime were the main obstacles to progress. Together with the adherence of Algeria to the NPT, actually a *de facto* NWFZ had come to existence. However, a formal treaty is preferable in order to secure the respect of nuclear-weapon states to the nuclear-weapon-free status of Africa. Hence, the formal steps taken by African nations to advance the process have included joint OAU and UN expert meetings in Addis Ababa in May 1991, in Lome in April/May 1992, and in Harare in April 1993.[241] Some of the agreements reached at the first two meetings were the following: The Treaty should establish OAU machinery to verify the operation of the Treaty, to promote the peaceful use of nuclear energy, and to address the issue of nuclear waste dumping; the nuclear-weapon states must provide negative security assurances; the Security Council should to ensure that assistance shall be given to any party subject to or threatened by nuclear attack (positive security assurances); all parties should conclude full-scope safeguards agreements with the IAEA; the

[241]The Harare Meeting took place one week after the then President de Klerk disclosed that South Africa had worked in the past on a limited number of military explosive devices and that the relevant facilities, equipment and materials had been subsequently dismantled, destroyed or converted to peaceful uses. See, Sola Ogunbanwo, 'Nuclear-Weapon-Free Zone in Africa', in Serge Sur (ed.), *Disarmament and Arms Limitation Obligations: Problems of Compliance and Enforcements*, Aldershot, Dartmouth for UNIDIR, 1994, pp: 136 - 141.

Treaty should be permanent; the Treaty should enter into force for the entire region, after it had been ratified by a specified minimum number of states.[242]

The African NWFZ Treaty (known as the Pelindaba Treaty) has been submitted to the UN General Assembly. The text of the Treaty was finalized at a meeting in South Africa in May-June 1995, between the UN expert group and an Intergovernmental Group of Experts of the OAU. It was subsequently submitted to the OAU's Council of Ministers which considered at a session in Addis Ababa on 21-23 june 1995, and made some amendments. After approval by the Assembly of Heads of State and Government of the OAU, the text of the Treaty was transmitted to the UN Security Council. A Resolution is adopted on the subject by the UN General Assembly during its 50th meeting. The Treaty is scheduled to be opened for signature at a conference in Cairo in early 1996.[243] With the Pelindaba Text of the African NWFZ Treaty, the parties to the Treaty convinced that *the zone will constitute an important step towards strengthening the non-proliferation regime,* promoting cooperation in the peaceful uses of nuclear energy, promoting general and complete disarmament and enhancing regional and international peace and security.[244]

In the light of the nuclear technology programmes of certain African countries including the disclosure by South Africa of its capability, the African NWFZ Treaty will contain a provision for the declaration of capability for manufacturing and stockpiling of nuclear explosive devices. It will also have a provision for dismantling and destructing any nuclear explosive devices, as well as production facilities. The provisions will also cover the conversion to peaceful uses, under strict and effective

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[242]See, David Fischer, *Efforts to Establish Other Nuclear-Weapon-Free Zones*, paper submitted to the IAEA Workshop on Modalities for the Application of Safeguards in a Future NWFZ in the Middle East, Vienna, Austria, 4 - 7 May 1993.

[243]See the UN Document A/50/426, 2/8.

[244]Pelindaba Text of the African Nuclear-Weapon-Free Zone Treaty, 4th Perambular paragraph, reproduced in *PPNN Newsbrief*, No: 32, 4th Quarter 1995, pp: 19 - 24.

safeguards. Measures to ensure compliance with this provisions of the Treaty are crucial to its successful implementation. Such measures will be accompanied by detailed enforcement actions which shall not become the subject of bargaining chips. The Treaty on an African NWFZ will fulfil the function of preventing a nuclear arms race on the continent by prohibiting the research, development, testing, manufacturing and storage of nuclear explosive devices. The establishment of a regional agency is envisaged for executing compliance functions, before referring such questions to outside bodies such as the UN Security Council, the General Assembly and the IAEA. Thus, Annex III of the Pelindaba Text provides for the establishment of an African Commission on Nuclear Energy (AFCONE) to determine compliance in the first instance.[245]

According to Article 12 of the Pelindaba Text entitled Mechanism for Compliance, the main purpose of AFCONE is to ensure that the Parties comply with their obligations. This concerns the activities prohibited in the interest of non-proliferation, and those permissible for the promotion of peaceful uses of nuclear energy. To that end, AFCONE will be responsible for collecting reports and information about the nuclear activities of the Parties including any significant event affecting the implementation of the Treaty. AFCONE would thereby apply the complaints procedure of the Treaty in case of violation of Treaty obligations, and request an extraordinary inspection by the IAEA. Hence, Annex IV of the Pelindaba Text entitled Complaints Procedures and Settlement of Disputes stipulates that a Party which considers that there are grounds for a complaint that another party is in breach of its obligations shall bring the subject matter of the complaint to the

[245] AFCONE will be composed of 12 Members elected for a three-year period, on the basis of the following criteria: their expertise and interest in the subject matter of the Treaty; equitable geographical distribution; and the need to include the countries with advanced nuclear programmes. A quorum of the meeting of AFCONE will be constituted by two-thirds majority of its Members, and decisions will be taken by a two-thirds of the Members present and voting. See, Ogunbanwo, 138.

attention of the party complained of and shall allow the latter thirty day to provide explanations and resolve the matter. Such bilateral consultations and arrangements may include "technical visits" agreed upon between the Parties. If the matter is not resolved, the complainant Party may bring the complaint to AFCONE. The first step to be taken by AFCONE is again to give forty-five days to the Party complained of to provide explanations. If AFCONE is not satisfied with the explanations, it may request the IAEA to conduct an extraordinary inspection as soon aspossible. The decision of AFCONE on the need to conduct extraordinary inspections is mandatory on the Parties. If AFCONE considers that the Party complained of is in breach of its obligations under the Treaty, states parties to the Treaty shall meet in extraordinary session to discuss the matter and may make recommendation to the the Party held to be in breach of its obligations and to the OAU. The OAU may, if necessary, refer the matter to the UN Security Council.[246]

v... The South East Asian Nuclear-Weapons-Free Zone

At the 29th meeting of the standing committee of the Association of South East Asian Nations (ASEAN) the Indonesian Foreign Minister announced that details of a South East Asian NWFZ were being finalized . On December 1995, the Treaty was signed at the fifth ASEAN summit meeting at Bangkok by leaders of seven members of that organization: Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam, and by Burma, Cambodia and Laos. They have rejected objections to the Treaty expressed by China and the United States, which reportedly see the Treaty as potentially restricting their freedom to move nuclear-powered or -armed ships or aircraft in the area. China is also understood to object to the fact that the Treaty applies to regions of South China Sea to which it lays claim.[247] Article 3 of the Treaty determines the basic undertakings of the states

[246]Pelindaba Text, Annex IV paragraph 1 thru 4(g).
[247]*PPNN Newsbrief*, No: 32, 4th Quarter 1995, p. 2.

party to the Treaty. Accordingly, states undertake not to develop, manufacture or otherwise acquire, possess or have control over nuclear weapons; not to station or transport nuclear weapons by any means; not to test or use nuclear weapons. States party to the Treaty further undertake not to allow on their territory to develop, manufacture, station, test or use nuclear weapons, nor to dump at sea or discharge into the atmosphere radioactive material. Moreover, each state party to the Treaty is obliged to conclude an agreement with the IAEA for the application of full-scope safeguards. With the Treaty a Commission is established for the Southeast Asian NWFZ which will oversee the implementation of the Treaty and ensure compliance with its provisions. And, the Executive Committee, established as a subsidiary organ of the Commision, will ensure the proper operation of verification measures in accordance with the provisions of the Control System as stipulated in Article 10 of the Treaty. Accordingly, the Control System shall comprise the IAEA safeguards system, report and exchange of information, and request and procedures for fact-finding mission. It is agreed that the Treaty enters into force on the date of the deposit of the seventh instrument of ratification and/or accession, and that the Treaty remain inforce indefinitely.[248]

B... Concept of Zones of Peace

The concept of Zones of Peace (ZP), in turn, started increasingly to gain currency in the 60's and 70's, in reaction to the growing number of regional foci of tension and to the expanding presence of the major powers in the various oceans of the globe. These were threatening to introduce external sources of confrontation in regions until then free from their rivalries. The Final Document of the United Nations First Special Session on Disarmament in 1978 pointed out that *the establishment of zones of peace in various regions of the world under appropriate conditions,*

[248]Full text of the Treaty including Annexes and Protocols is reproduced *PPNN Newsbrief*, No: 32, 4th Quarter 1995. pp: 24 - 28.

to be clearly defined and determined freely by the states concerned of the zone, taking into account the characteristics of the zone and the principles of the Charter of the United nations, and in conformity with international law, could contribute to strengthening the security of the States within such zones and to international peace and security as a whole.[249] In 1981, the United Nations prepared a study on all the aspects of regional disarmament, in which both the NWFZ and ZP were surveyed as examples of regional initiatives to promote disarmament.[250] Regarding a precise definition for zones of peace, although the study stated that "it cannot be given a universally valid definition in terms of one or several specific measures", it nonetheless noted that "in the proposals made up to now, several elements can ... be identified, which together may serve to characterize the concept." These are the followings:

a...keeping of the zone away from the interference of extra-zonal powers, and from the global arms race;

b...maintenance of regional peace, security and stability by means of political cooperation and military restraint;

c...promotion of regional cooperation in economic, social, political and other fields;

d...acceptance and respect of extra-zonal states for the concept and for the specific provisions of the zone.

Apparently, the concept of a zone of peace is more fluid, and at the same time more comprehensive than the concept of nuclear-weapon-free zone, since it encompasses not only disarmament measures but also aims at promoting cooperation in political and economic terms, and refers not only to nuclear weapons but also to measures in the conventional field. The zones of peace were introduced

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[249] Tenth Special Session of the United Nations of the General Assembly devoted to Disarmament. Final Document, 30 June 1978.

[250] See the *Study of All Aspects of Regional Disarmament*, United Nations Document, A/35/416, 1981.

for the first time at the Second Summit Conference of Non-Aligned Countries held in Cairo from 5 to 10 October 1964, and was applied primarily to ocean areas. At the Third Summit Conference in Lusaka, from 8 to 10 September 1970, a proposal to transform the Indian Ocean into a zone of peace was specifically approved and has ever since become the object of attention at Non-Aligned meetings, as well as at UN General Assembly discussions."[251]

i... The Indian Ocean Zone of Peace

The Indian Ocean as a Zone of Peace came about in 1971, on the basis of the initiatives of the Sri Lankan delegation at the United Nations General Assembly. The UNGA adopted Resolution 2832 which solemnly declares the Indian Ocean a Zone of Peace (IOZP). The Resolution called upon the great powers to enter into immediate consultations with the Littoral States of the region, with a view to halting the expansion of their military presence, and to eliminating military bases and installations as well as nuclear weapons therefrom. The cause behind the mounting movement to establish a zone of peace in the Indian Ocean lay in the fears, among the non-aligned countries in the region, of a global confrontation between the superpowers, in the wake of the Vietnam War, that would spill over to the Indian Ocean. Verification and monitoring of the undertakings by the zonal and extra-zonal states are thought to be dealt with at a later stage.

ii... The Zone of Peace and Co-Operation in the South Atlantic

Similarly, the Zone of Peace and Co-Operation in the South Atlantic (ZPCAS), was defined as a zone of peace and cooperation, where outside sources of tension were to be eliminated and intra-zonal cooperation fostered. The initiative to create the ZPCAS was launched by the Brazilian President at the 40th session of the General Assembly. The proposal was drafted by 14 countries from the region, and

[251] Fujita, ibid., pp: 13 - 15.

was adopted by 124 in favour (including China, USSR and the UK), 1 against (USA), and 8 abstentions (including France, F.R. Germany and Japan). The main objectives of the ZPCAS for the benefit of the countries in the South Atlantic zone were the promotion of regional cooperation in the economic and social fields, the protection of environment and the preservation of the biological resources, as well as the maintenance of peace and security in the region as a whole. As for the purposes of verification, the first meeting of the states of ZPCAS established a periodical consultation mechanism among the states in order to pursue the common objectives of the Declaration of ZPCAS. It also instituted the role of a coordinator responsible in consultation with all States in the zone, for fostering actions and measures to facilitate the achievement of the objectives of the Declaration of ZPCAS, and for receiving, collating and transmitting any relevant information and communications among all states in the zone.

There have been (and still are) other initiatives to establish such zones in different parts of the globe, including the Northern (Nordic) and Central Europe, the Balkans, and the Mediterranean. The fate of these proposals has mostly been affected by the conjuncture in world politics, and thus the attitudes of the 'big-five'. Therefore, it is not surprising that the most successful example of compliance by the nuclear weapons states with the denuclearized and demilitarized zone is the Antarctic Treaty, where all relevant nuclear weapons states and militarily significant states are parties to and have great interest in its smooth functioning.

CHAPTER VIII. SUCCESSFUL CASES OF EFFECTIVE REGIONAL COOPERATION IN THE NUCLEAR FIELD: EURATOM & ABACC

A... Nuclear Cooperation in Western Europe: EURATOM

The devastating effects of the two World Wars in this century on continental Europe, which costed millions of lives and treasures lost, urged politicians, scientists, scholars, bureaucrats, all concerned figures from different fields and strata of the peoples of Europe, to find a way of putting an end to the hostilities among the states in the region, and to promote peace and friendship. Due to the very fact that the 'war machine', or the 'armoury', was essentially made of steel composed of iron and coal, it was thought that keeping these basic elements under control, would eventually allow to keep the development of 'armouries' under control. This way of thinking, among others, gave way to the emergence of the European Coal and Steel Community (ECSC) in 1950, whose principal actors were France and Germany. Hence, the idea of a 'united Europe' practically came about with the ECSC. However, the very same years had already witnessed an unprecedented weapon, namely the atomic bomb developed and used by the United States. This weapon technology was nonetheless bound to spread, in one way or the other, because of the never-satisfied 'appetite' and curiosity of the scientists.[252] Hence, the same Europeans who had somehow found a way to control the 'war machine', then again had to find a way to prevent further spread of this 'brand new' scientific discovery. The Continent's land for science and technology was very fertile. Accordingly, the idea of "atoms for peace" had to go beyond mere rhetorics. What would the Germans do with an atomic weapon, given what they have done without such a

[252] This should by no means imply that the deliberate attempts of the politicians to acquire such a strategic asset at their disposal had a lesser role. One may even think that, the politicians urged the scientists to develop their own bomb indigenously.

weapon? The European Atomic Energy Organization (later EURATOM) was created in such a state of mind.

Nevertheless, giving birth to EURATOM was not an easy process politically, nor a straightforward one technically. EURATOM had to harmonise dissimilar and somewhat conflicting interests of various states both inside and outside the region. In particular, France had 'nuclear ambitions' on the one hand, and was equally committed to not to leave the 'floor' to W. Germany in the nuclear field, on the other. The latter aim of France did well coincide with that of the other European states, the United States and the Soviet Union. Notwithstanding, the French determination to 'go nuclear' was in no way accepted by the United States, nor by the Soviet Union. However, it was clear that unless France gave its consent, no talk of a European institution which would control the further spread of nuclear weapons would be possible, nor might W. Germany be under effective and close scrutiny. This was a 'trade-off' for the United States which finally culminated in its generous support for EURATOM. But a similar 'trade-off' was also the case for France. Since, unless the United States supported the idea of EURATOM, politically and technologically, it would have been very difficult for France to develop its infantile nuclear research programme in relatively short time.

Then, the sides agreed that this European institution had to be endowed with stringent verification provisions. The degree of stringency had to meet the US standards, otherwise the US inspectors themselves would have had to carry out inspections in the European nuclear installations. This was something the Europeans would like to avoid absolutely.[253] Concomitantly, the IAEA was in the process of establishing its global safeguards system, and there were concerns that the

253 Particularly the French always considered such US involvements as an interference in their sovereignty.

EURATOM system might undermine this objective.[254] It was argued that the US support for EURATOM had "effectively ended any chance that the IAEA would develop into a universal safeguards system. Once this Pandora's box was opened, little possibility remained that other nations would readily agree to nuclear transfer terms more rigorous than those imposed upon EURATOM.[255]

However, the US support was secured, and much of this was due to the Final Report of the Conference convened at the Princeton University in 1956.[256] The Report listed the advantages for the United States if EURATOM adopted a strict control system. According to the Report, these advantages were mainly three-folds. First, the Western Europe would probably become the most important area of nuclear power development[257], apart from the United States and the Soviet Union.

[254]Darryl A. Howlett, 'Regional Nuclear Co-Operation and Non-Proliferation Arrangements: Models from Other Regions', in Darryl A. Howlett & John Simpson (eds.), *East Asia and Nuclear Non-Proliferation*, Papers from Twelfth PPNN Core Group Meeting, Japan, 28-29 November 1992, pp: 63-71.

[255]See, Charles K. Ebinger, *International Politics of Nuclear Energy*, London, Sage Publications, 1978, quoted in Darryl Howlett, *EURATOM and Nuclear Safeguards*, London, MacMillan Press, 1990. p. 71.

[256]The political agenda in the mid-1950s was dominated by the issues relating to the security of Western Europe, the NATO alliance, and the Cold War. While the US authorities were willing to foster the European integration, on the one hand, they were equally dubious about the extent of this integration would go. They didn't wish for a challenging integration which might have adversely affected their nuclear supremacy within the NATO alliance, nor did they want to leave Western Europe to the 'menace' of the Soviets. In such a political atmosphere, many scholarly figures were interested in these politico-military issues. The result was the establishment of centers, either under the auspices of universities or as independent foundations, mandated to carry such strategic studies. Indeed, the pioneers of these centers were established in the United States as early as the 1920s. Hence, in May 1956, EURATOM and its NATO implications were the central themes for discussion at a conference held at Princeton University. The conference was convened to provide policy advice to the government regarding the kinds of overtures the United States should make towards EURATOM. Among the participants at the conference chaired by Klaus Knorr, there were also figures from the US State Department and the US Atomic Energy Commission.

[257]By investing in nuclear industry and nuclear research not all the states of Western Europe opted to pursue "nuclear ambitions". At the time, nuclear energy production was seen as a powerful and effective alternative for the industrialized European countries in need of huge amounts of energy. In mid-1955 the Benelux countries introduced what was known as the *Benelux Memorandum*, within the forums of the ECSC, calling for closer European unity based on measures designed to promote functional integration in the area of nuclear power. A concomitant attempt to promote nuclear cooperation surfaced in the Franco-German nuclear agreement of 30 April 1955 as the result of the desire of these two countries to plan jointly the future developments of nuclear energy. During the course of discussions on the modalities of a European organization in the nuclear field, it was often stressed that the establishment of a common atomic organization would serve as an instrument for closing the gap between domestic energy supplies and the

Second, an experimentation with a tight international control mechanism, though in a limited area, could set an example for the evolution of a tight universal system among nations. Third, the United States would be relieved from the necessity of inserting itself actively, through the terms of its bilateral program, in the control problem in that part of the world.[258]

In a way, this report revealed the US point of view on EURATOM's proposed safeguards procedures as being more promising than the procedures agreed upon in the IAEA's Statute. The latter was indeed a reflection of a compromise under the circumstances of the Cold War.[259] Therefore, for the US authorities, the idea of supporting the European proposal seemed interesting, especially since these safeguards procedures were actually derived from the safeguards provisions contained within the United States bilateral nuclear transfer agreements, and the United States domestic nuclear law. Moreover, the ideas that have been put forth at the time of the Acheson-Lilienthal Report and the Baruch Plan were inschrined into the EURATOM safeguards provisions. Therefore, these provisions were much like an *American cloth designed à taille Européenne.*

i... Fundamentals of EURATOM's Safeguards System

The fundamental clauses of the EURATOM safeguards procedures[260] can be found in Chapter VII of the EURATOM Treaty,[261] which comprises Articles 77 to 85.

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increasing demand for energy in these countries. Moreover, since the conventional energy sources were imported and were subject to external influences, it was thought that indigenous production of nuclear energy would reduce this dependency.

258Under the system then envisaged, the United States could depend on the French to watch the Germans, the Germans to watch the French, and the smaller nations to watch both the French and the Germans. See Klaus Knorr, *EURATOM and American Policy: A Conference Report*, Princeton, Center for International Studies, Princeton University, 1956, cited in Darryl Howlett, *EURATOM...*, ibid., pp: 72-73.

259Mostly because of the Indian opposition (and of the Soviets to some extent), the United States had faced difficulties in getting an agreement in the IAEA Board of Governors on an effective safeguards system.

260For a recent and comprehensive survey on the emergence and evolution of the 'EURATOM Safeguards System', and its political implications on the relations both among the friends and the

The significant feature of these nine Articles is that, when taken together, they encapsulate a whole range of different safeguards ideas. Some of these were quite novel to EURATOM and were therefore largely untested. Others were drawn from ideas developed in different industries. Still others did have a track record in nuclear regulation. But what is noteworthy about all these ideas is that they are broadly representative of the entire spectrum of safeguards thought up to that time. When taken as a whole, the EURATOM Safeguards Articles reveal a concerted attempt on the part of their authors to mould together a coherent set of nuclear energy control provisions.[262]

a... article 77

Accordingly, Article 77 of the EURATOM Treaty states that *..the Commission shall satisfy itself that, in the territories of Member States, (a) ores, source materials and special fissile materials are not diverted from their intended uses as declared by the users, (b) the provisions relating to supply and any particular safeguarding obligations assumed by the Community under an agreement concluded with a third State or an international organization are complied with.* Together with this, Article 2 of the EURATOM Treaty required the EURATOM Commission to ensure, *by appropriate supervision, that nuclear materials are not diverted to purposes other than those for which they are intended.*

b... article 78

For the attainment of the objectives set out in Articles 2 and 77, the Treaty required from the operators, with Article 78, a declaration to the Commission concerning the *basic characteristics of the installations* set up or operating *for the*

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foes during the Cold-War period see, Darryl A. Howlett, *EURATOM and Nuclear Safeguards*, ibid.,

[261]The EURATOM Treaty was signed on 25 March 1957 at Rome, initially by Belgium, France, Luxembourg, the Netherlands, F.R. Germany, and Italy that had established the European Economic Community (EEC).

[262]Darryl A. Howlett, *EURATOM..* p. 87.

production, separation or other use of source materials or special fissile materials or for the production of irradiated nuclear fuels. Similarly, an approval by the Commission of *the techniques to be used for the chemical processing of irradiated materials* was made obligatory by the Treaty.

b... article 79

Since the European authorities were determined to secure the US's political and technological support without their direct involvement, the proposed US-EURATOM safeguards agreement had two basic features: a system of *checks* to ensure that reliable nuclear accountancy records were being kept; and a system of *inspection* implemented by a EURATOM safeguards inspectorate comprised of EURATOM nationals only, in order to verify that the information supplied in the accountancy records was accurate. Accordingly, Article 79 of the EURATOM Treaty encharged EURATOM with setting up a rigorous system of nuclear accountancy. To this end, the Commission required that *operating records be kept and produced in order to permit accounting for ores, source materials and special fissile materials used or produced. The same requirement shall apply in the case of the transport of source materials and special fissile materials. Those subject to such requirements shall notify the authorities of the Member State concerned of any communications they make to the Commission pursuant to Article 78 and to the first paragraph of this Article.* With Article 79, the designers of the EURATOM Treaty did not only satisfy their American counterparts who insisted on a strict and reliable material accountancy system so as to allow transfer of nuclear material and technology, but they equally set up a system for themselves regarding their potential for nuclear trade and the related security issues

d... article 81

Similarly, to restrict the intrusion of the US inspectors, the Europeans set on to draft safeguards inspection provisions in such a way that even the US authorities would agree on not to carry out their own inspections in European installations. The terms of the Article 81 is a clear indicator of this attempt to convince the US of the stringency of EURATOM's safeguards provisions. Hence, Article 81 states that: *The Commission may send inspectors into the territories of Member States....inspectors shall at all times have access to all places and data and to all persons who, by reason of their occupation, deal with materials, equipment or installations subject to safeguards...in order to apply such safeguards to ores, source materials and special fissile materials and to ensure compliance with the provisions of Article 77... if the carrying out of an inspection is opposed, the Commission shall apply to the President of the Court of Justice in order to ensure that the inspection be carried out compulsorily.... if there is a danger in delay, the Commission may it self issue a written order in the form of a decision, to proceed with the inspection....*[then] *the authorities of the State concerned shall ensure that inspectors have access to the places specified in the order or decision.*

e... article 82

In the same regard, in Article 82, the Treaty brought clarity to the task of the inspectors and their selection by stating that *inspectors shall be recruited by the Commission* [and] *they shall be responsible for obtaining and verifying the records referred to in Article 79. They shall report any infringements to the Commission.* Thus, neither objections to the designation of the inspectors, nor attempts to retard the proper inspections were allowed to create a serious problem in the EURATOM Treaty.[263] To ensure compliance, the EURATOM Treaty granted the Commission the right to impose *sanctions* on persons or undertakings operating nuclear installations in the event of an infringement.

[263]As it is the case for the IAEA safeguards procedures, such 'tools' can very well be exploited by most of the 'nuclear going' states in order to gain time to hide their secrets. Even under the terms of the UNSC Resolution 687, Iraqi authorities 'dragged their feet' either by objecting to the inspectors or by not giving them proper 'escort' services to transfer the teams to the inspection sites. In a way, Iraqi leadership opted to play a 'cat and mouse' game with the UNSCOM inspectors.

f... article 83

In Article 83, these sanctions are listed *in order of severity* as follows: *(a) a warning; (b) the withdrawal of special benefits such as financial and technical assistance; (c) the placing of the undertaking for a period not exceeding four months under the administration of a person or board appointed by a common accord of the Commission and the State having jurisdiction over the undertaking; (d) total or partial withdrawal of source material or special fissile materials.*[264] The Treaty deemed important the proper implementation of the above measures for effectiveness and credibility reasons, and therefore it stated that *requiring the surrender of materials shall be enforceable.*

g... article 84

The scope of application of the EURATOM safeguards is elucidated in Article 84 which satisfied the French that nothing in the Treaty would preclude them from developing their atomic explosive device. Hence, Article 84 gave way to the French military nuclear programme by not extending the application of safeguards *to materials intended to meet defence requirements.* As Lawrence Scheinman stated, no Article of the Treaty limited a nation's right to use atomic energy for military purposes.[265] The United Kingdom, which had "gone nuclear" a decade ago, and France stand as the two nuclear weapons states party to the EURATOM Treaty.[266] Though Article 84 exempted materials intended to meet defence requirements from safeguards application, it by no means stipulated that these installations were to be excluded from the obligation of furnishing information to the Commission. However, neither France, nor later the United Kingdom have interpreted these

264The last sanction, which meant the confiscation of the precious assets of the violating party, is quite severe and thus of a deterring nature.
265Lawrence Scheinman, *Atomic Energy Policy in France under the Fourth Republic*, Princeton, Princeton University Press, 1965, pp: 185-186, quoted in Howlett, *EURATOM...* p. 96.
266Taking into consideration the evolutions of the nuclear energy programmes of both the United Kingdom and France, and their privileged seats in the international Council that "governs" the international politics, an "excuse" can be apprehended with regard to the Article 84 of the EURATOM Treaty which would be totally irrelevant for a treaty establishing other NWFZs in the world.

clauses in the sense of the Commission, nor did they allow inspection in their defence oriented facilities.[267]

h... article 52

One important feature of the EURATOM Treaty is that, with Article 52 in Chapter VI, it provides basis for the establishment of the *Supply Agency* by stating that the Agency *shall have a right of option on ores, source or special fissile materials produced in the territories of the Member States and an exclusive right to conclude contracts relating to the supply of ores, source materials and special fissile materials coming from inside the Community or from the outside.* Similarly, with Article 86 in Chapter VIII of the EURATOM Treaty, it is decided that the *special fissile materials shall be the property of the Community. The Community's right of ownership shall extend to all special fissile materials which are produced or imported by a Member State, a person or an undertaking and are subject to safeguards provided in Chapter VII.* In the same regard, Article 88 stated that *the Agency shall keep a special account in the name of the Community, called Special Fissile Materials Financial Account.*.[268]

[267]A clarity was brought to this dispute in mid 1970s, with the Article 35 of the Commission Regulation 3226/76. This particular Article provides very explicit instructions about exactly what information is to be transferred from the State to EURATOM where military facilities are concerned. Hence, Article 35 of the Regulation states that *1. The provisions of this Regulation shall not apply: (a) to installations or parts of installations...assigned to meet defence requirements...or (b) nuclear materials...assigned to meet defence requirements....3. It is understood in any event that: (a) the provisions of Articles 1 to 4* [Basic technical Characteristics and Particular Safeguards Provisions Declaration of the Technical Characteristics], *and 7 and 8* [Particular Safeguards Provisions] *shall apply to installations or parts of installations which at certain times operated exclusively with nuclear materials liable to meet the defence requirements but at other times operated exclusively with civil nuclear materials; (b) the* [same] *provisions....shall apply, with exceptions for reasons of national security, to installations or parts of installations to which access could be restricted for such reasons but which produce, treat, separate, reprocess or use in any other way simultaneously both civil nuclear materials and nuclear materials assigned or liable to be assigned to meet defence requirements.*

[268]The rights and duties conferred to the Supply Agency, and to the EURATOM Commission which was to supervise it, were undoubtedly far-reaching. It was argued that these provisions were no mere monitoring, or keeping an eye on, but total control of and responsibility for supply. See, Howlett, *EURATOM*..., ibid.,

There are similarities with the wording of the these Articles and that of the *Acheson-Lilienthal Report* which emphasized that the supply of uranium was indispensable to the production of nuclear weapons, and that any control would have to provide adequate safeguards regarding raw materials. Accordingly, the authors suggested the establishment of the International Atomic Development Authority (IADA) with far-reaching powers to control every level of activity leading from raw materials to weapons. [269]

ii... Commission Regulations

The EURATOM Treaty was signed in 1957, however some additional regulations were required to put it into effect. Thus, in 1959 and 1960 the Commission of the European Communities adopted two Regulations (7 & 8) which formally started the operation of the terms of the Treaty.

a... commission regulation 7

Regulation 7 provided for the Commission to determine *the procedure for completing the declarations laid down in Article 78 of the Treaty.*[270] Accordingly, the Member States were required to provide the Commission with the following informations: the type of the reactor and its principal use; its thermal power rating; its fuels (composition and enrichment of fissile material); brief description and general plans for the installation; the technical processes employed. Even though the scope and the purpose of Regulation 7 was thought to enable the Commission to implement Article 78 in the territory of EURATOM countries, differing

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[269] According to the Report, the IADA would be effective if it were given the responsibility for the following activities: 1..the ownership or the leasing of the world supplies of uranium and thorium; 2..the construction and operation of all reactors and separation plants; 3..the conducting of research; and 4..the inspection of all activities under its control. However, these proposals found little endorsement in the international circles.

[270] See the *Official Journal of the European Communities - Special Edition 1959-1962 (November 1972)*, p. 23.

interpretations between the EURATOM Commission and France (and later the UK) have made this difficult.

b... commission regulation 8

The Commission Regulation 8, on the other hand, aimed at providing *the guidelines for proper implementation of the terms of the Article 79*. It thus required operators to furnish information concerning the details of their stocks and movements of ores, source materials and special fissile materials. Regarding this information the Commission would then be provided with reliable records of the whole range of materials used and stored in the nuclear installations within the Community. It would then be possible to detect any loss or diversion of nuclear materials during the inspections. In the early 1960s the nuclear trade began to increase, both in scope and volume, requiring an increase in inspections.

c... commission regulation 10

In order to be cost-effective and to ensure an efficient use of resources, regarding the limited number of inspectors vis-à-vis the number of inspections required arising from these increasing transactions, the Commission adopted Regulation 10 in 1962. With this regulation, the smaller quantities (at most several dozens of grams) of nuclear materials which did not need inspection were identified, and thus, the EURATOM Treaty allowed the transfer of these materials without being subject to safeguards inspection.

iii... The Age of the NPT and EURATOM

In the second half of 1960s and in the early 1970s, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and its safeguards procedures to be implemented by the IAEA were of much concern for the authorities of both the IAEA and EURATOM. With the entry into the force of the NPT, the IAEA would be mandated to carry out safeguards inspections in the territories of the non-nuclear weapon states party to the Treaty. However, EURATOM's inspections were already underway in the territories of the European Community Member States. Therefore, the latter's regional safeguards would be likely to cause considerable problems to the universal aspirations of the former unless an effective way could be found for them to co-exist.

a... uneasy co-existence: IAEA & EURATOM

The problem was mainly two-fold: First, was the nature of the safeguards procedures to be applied to the EURATOM countries; and second, the organization to be entrusted with the responsibility of implementing these safeguards. Accordingly, a question arose: would EURATOM survive to the existence of the IAEA ? However, West Germany and Italy strongly opposed to the abolishment of EURATOM, while the Benelux countries tended to support the Non-Proliferation Treaty. But in general, the EURATOM authorities' view was to keep their primary responsibility of carrying safeguards, while letting the IAEA act as a verifier of their job. Nevertheless, the IAEA authorities thought in a totally different way. According to them, EURATOM had to forgo its safeguarding role and leave the floor to the IAEA's safeguards implementation. An underlying cause of concern was the strong opposition of the Soviets who had never acknowledged EURATOM's status, asserting that it was nothing more then self-inspecting. Hence, for them, IAEA inspections would give credible results, and thus could keep West Germany under close scrutiny. But in the contrary, EURATOM authorities insisted on the 'non-disputable' effectiveness of their safeguards system, and they wanted to retain it.

b... a solution for co-existence

Even by the time the NPT was signed in 1968, the IAEA-EURATOM safeguards issue had still not been resolved. However, Article III of the NPT, that was eventually agreed, did include an acknowledgement of regional safeguards systems, thus giving an official recognition (if somewhat obliquely) to EURATOM's continued safeguards existence.[271] Paragraph four of Article III states that *non-nuclear-weapon States Party to the Treaty shall conclude agreements with the International Atomic Energy Agency to meet the requirements of this Article either individually or together with other States in accordance with the Statute of the International Atomic Energy Agency.* For the EURATOM authorities, the inclusion of this clause to the NPT which does not insist upon individual safeguards agreements, meant the recognition of their safeguarding role. Nevertheless the debate had not ended on which organization would have the responsibility to carry out safeguards in Western Europe with the entry into force of the NPT.

c... IAEA Safeguards Document for EURATOM States: INFCIRC/193

In May 1970, the IAEA Board of Governors established the Safeguards Committee to determine the essentials of a standard (model) agreement to be applicable to the non-nuclear weapon states party to the NPT. The result was *the Structure and Content of Agreements Between the Agency and States Required in Connection With the Treaty on the Non-Proliferation of Nuclear Weapons,* namely the INFCIRC/153. Accordingly, following the negotiations between the IAEA and EURATOM, both sides agreed on a document designated as INFCIRC/193. In July 1972, the non-nuclear weapon states of the European Community (i.e., West Germany, Italy, Belgium, the Netherlands and Luxembourg), EURATOM and the IAEA concluded this agreement. The parties signed it in April 1973 with Denmark and Ireland. The INFCIRC/193 was very similar to the standard INFCIRC/153 agreement, and carried out an additional component in the form of a Protocol which contained a detailed *modus vivendi* on how the safeguards agreement would work in practice. This was a completely new innovation as it was the first attempt to marry

[271] Howlett, *EURATOM...*, ibid., p. 137.

together two different safeguards systems.[272] The safeguards arrangements were put into force in May 1975 with the ratification by all the non-nuclear-weapon states of the Community. However, this has required the entry into force of the Commission Regulation 3227/76 which contained a detailed outline of the provisions by which the INFCIRC/193 could be implemented in the territories of the EURATOM Member States. The safeguards agreement required the states party to the Treaty to set up a State's System of Accounting for and Control of (SSAC) nuclear materials (paragraph 32), then EURATOM became the SSAC for the INFCIRC/193.

iv... IAEA Inspections in EURATOM Non-Nuclear Weapons States

The IAEA was entitled, by the terms of the INFCIRC/193, to carry three different types of on-site inspections in the nuclear installations of the EURATOM Member States: First, *ad hoc* inspections, as stated in Article 71, in order to: *(a) Verify the information contained in the initial report on the nuclear material ... and identify and verify changes in the situation .... (b) Identify and verify if possible the quantity and composition of nuclear material .... before its transfer out of or upon its transfer into the States except for transfers within the Community.* Secondly, routine inspections, as stated in Article 72, in order to: *(a) Verify that reports are consistent with records; (b) Verify the location, identity, quantity and composition of all nuclear material subject to safeguards.... (c) Verify information on the possible causes of material unaccounted for* [MUF], *shipper/receiver differences and uncertainties in the book inventory.* Finally, the third type of inspections allows the IAEA conduct special inspections, as stated in Article 73, in order to: *(a) .... verify the information contained in special reports; or (b) If the Agency considers that the information made available by the Community including explanations from the Community and information obtained from routine inspection, is not adequate for the Agency to fulfil its responsibilities.*

[272] Ibid., p. 151.

Therefore, while on the one hand, EURATOM would carry out its own inspections based on the terms of the EURATOM Treaty; on the other hand, the IAEA would make its own independent verification to ensure that EURATOM has done its job properly. Therefore, with the entry into force of the INFCIRC/193, the overall scope of the safeguards provisions differed from those readily established in the EURATOM Treaty. Specifically speaking, while the latter covered the entire nuclear fuel cycle from mining of uranium to the reprocessing of the spent fuel, the former did not cover these activities. Accordingly, it was necessary to amend the European Community Regulations to secure proper implementation of INFCIRC/193 in the EURATOM Member States. Regulation 3226/76 incorporated the necessary clauses to this end. Hence, the task of the inspectors, and the duties of the operators were adjusted to the NPT 'environment'. The inspection rights that were spelled out in the EURATOM Treaty (*..inspectors shall at all times have access to all places..*) were not covered by this regulation.

The IAEA and EURATOM, having gained experience over two decades by applying safeguards jointly, are now keeping up much smoother relations in comparison with the past. As David Fisher observed, "[o]n occasion, each agency tended to debate, with an almost theological intensity, the abstract principles to which it is attached. But by now, there is no doubt on either side that each is fully committed to the same objective in the non-nuclear-weapon states of the [EU] or that the other agency's operations are technically effective."[273] Now, the two agencies share, rather than duplicate, the routine safeguards operations. "On 28 April 1992, it was reported that the IAEA and EURATOM had in fact agreed to a new 'partnership approach. Under this agreement, their safeguards operations [are]

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[273] David Fischer, 'Innovations in IAEA Safeguards to Meet the Challenges of the 1990s', in David Fischer, Ben Sanders, Lawrence Scheinman and George Bunn (eds.), *A New Nuclear Triad: The Non-Proliferation of Nuclear Weapons, International Verification and the International Atomic Energy Agency*, Southampton, Mountbatten Centre For International Studies, PPNN Study Three, September 1992, p. 33.

more closely integrated and inspections [are] carried out 'on the principle of one-job-one-man'. They .. share analytical resources so as to reduce the number of samples to be taken and they .. seek to reduce human inspection by greater use of equipment. The new arrangement .. permit[s] each agency to draw its independent conclusions about compliance with the IAEA/EURATOM agreement."[274]

B... Nuclear Cooperation in Latin America: ABACC

The nature of the Argentine-Brazilian relations have been complex for about half a millennium. The territorial disputes between the Spanish and Portuguese colonial empires largely determined the fate of the relations. The deep rooted mistrust forged by the competition for the 'leadership' of South America has been one motivating factor on both sides to unfold their competition onto the international markets, particularly in the nuclear field. Both countries have long established nuclear energy programmes.[275]

[274]Ibid., p. 34.

[275]The success of Argentine-Brazilian rapprochement in the nuclear field has elevated this issue once again high on the agenda of the scholarly research and articles, but this time to mention the prospects for collaboration, rather than rivalry. Until very recently, both countries were ranked within the group of "threshold states" together with India, Pakistan, Libya, Algeria, South Africa, and Israel. Fortunately, in line with Argentina and Brazil, some of these threshold states too, have denounced the nuclear option and adhered to the non-proliferation regime. For introducing the reader to the past events that have motivated Argentina and Brazil to "go nuclear", and the most recent series of events that have paved the way to robust cooperation, references will be made to a 'subset' of a plethora of articles and books available in these regards, such as: John R. Redick, Julio C. Carasales, and Paulo S. Wrobel, "Nuclear Rapprochement: Argentina, Brazil, and the Nonproliferation Regime", *The Washington Quarterly*, 18:1, pp:107 - 122; Paulo S. Wrobel, *Brazil - Argentina Nuclear Relations: An Interpretation*, unpublished manuscript, April 1994; John R. Redick, "Argentina-Brazil Nuclear Non-Proliferation Initiatives", *Programme for Promoting Nuclear Non-Proliferation*, Issue Review, January 1994, No:3; Virginia Gamba-Stonehouse, 'Argentina and Brazil', in Regina Cowen Carp (ed.), *Security With Nuclear Weapons ? Different Perspectives on National Security*, Oxford University Press for SIPRI, 1991, pp: 229 - 256; Marco A. Marzo, Alfredo L. Biaggio, and Ana C. Raffo, "Nuclear Co-operation in South America: The Brazilian-Argentine Common System of Safeguards", *IAEA Bulletin*, Vol.36, No: 3, 1994, pp: 30 - 35; Tom Zamaro Collina and Fernando de Souza Barros, "Transplanting Brazil and Argentina's Success", *ISIS Report*, Institute for Science and International Security, Rio de Janero, February 1995; John R. Redick, "Latin America's Emerging Non-Proliferation Consensus", *Arms Control Today*, Vol. 24, No: 2, March 1994, pp: 3 - 9; Jose Goldemberg and Harold A. Feiveson, "Denuclearization in Argentina and Brazil", *Arms Control Today*, Vol. 24, No: 2, March 1994, pp: 10 - 14; Darryl A. Howlett, 'Regional Nuclear Co-Operation and Non-Proliferation Arrangements: Models from Other Regions', in Darryl A. Howlett & John Simpson (eds.), *East Asia and Nuclear Non-Proliferation*, Papers from Twelfth PPNN Core Group Meeting, Japan, 28-29 November, 1992, pp: 63-71; Monica Serrano, *Common Security in Latin America: The 1967 Treaty of Tlatelolco*, University of London, Institute of Latin American Studies, Research Papers, 1992;

i... Argentina & Brazil: from Rivalry to Cooperation

Argentina's nuclear programme began in the 1950s, and gathered pace in the 1970s when its first nuclear plant, Atucha I, began operation in 1974. Other construction plans followed with the nuclear installations Atucha II and Embalse. Argentina also developed indigenous gaseous diffusion capability for uranium enrichment. Brazil, on the other hand, pursued a 'twin-track' nuclear development policy based on indigenously produced fuel cycle facilities, especially ultra-centrifuge enrichment, and imports of nuclear technology.[276] And, in 1975 West Germany agreed to supply Brazil with reprocessing and enrichment technology as an incentive for purchasing nuclear reactors.[277] Actually, since the mid 1960s, though the rivalry survived between Argentina and Brazil, both countries had one issue of common interest. It was the universal effort to curb proliferation of nuclear weapons, which equally meant some restrictions for most of the countries' nuclear engagements. Such restrictions would presumably adversely affect these two rival states. Hence, Argentina and Brazil had no alternative but to cooperate somehow to protect their common interest by acting in parallel, if not together, in international fora.[278] As the Tlatelolco negotiations continued (post 1964s), Argentina and Brazil increasingly found their positions in tandem, and contrary to the views of the majority of Latin American nations. Argentina and Brazil's shared objective became the mitigation of the more restrictive elements of Tlatelolco and the preservation of independence of their nuclear programmes from regional or international constraints. This

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Thierry Riga, *Une approche coopérative de la non-prolifération nucléaire: l'exemple de l'Argentine et du Brésil*, UNIDIR Research Paper, No: 29. 1994.

[276]See, Darryl Howlett, *Regional Nuclear Co-operation...*, p. 66. See also, Thierry Riga, *Une approche coopérative...*, pp: 12 - 20.

[277]See, John R. Redick *et al.*

[278]It is indeed interesting to note that, Brazil was one of the forerunners of the idea of a nuclear-weapon-free zone in Latin America. At the XVII session of the United Nations General Assembly in 1962, it was the Brazilian delegation whom suggested for the first time such a zonal arrangement in Latin America. But the military coup in 1964, which produced two decades of military rule, has shifted Brazil's position to the one which opposed such regional or universal agreements. Their denial of adherence to the NPT was on the basis of the "discriminatory" nature of that agreement.

represented the first step of an extended bilateral nuclear confidence-building process which, despite the traditional rivalry, linked the two nations against a commonly perceived enemy: the non-proliferation regime.[279] Therefore, when the West German deal was seen as a proliferation initiative by the US administration, the Argentine-Brazilian collaboration gained momentum.

a... joint communiqué

On the same account, the foreign ministers of Argentina and Brazil issued a joint communiqué calling for cooperation and technical exchange in the nuclear field. This was followed in 1979 by an important agreement establishing a framework for the resolution of the problems in the River Plate area.[280] This coordination opened the door for an across the board improvement in bilateral relations particularly in the economic sphere, but also in the politically sensitive nuclear area. In 1980, the two nations signed a small but symbolically important agreement (Corpus-Itaipu) for nuclear fuel cycle cooperation, which included a clause calling for systematic coordination of nuclear policy in all international fora. Consequently, collaboration in the nuclear field, rather than competition, was viewed as the best means to surmount the barriers represented by the inequitable non-proliferation regime.[281]

b... democratization

Major progress on opening up sensitive nuclear facilities, however, was not made until both countries elected democratic governments. Right after these elections Argentine authorities announced their country's capability to enrich uranium, but equally ensured their Brazilian counter-parts that this enrichment

[279]John R. Redick, *et al.*, p. 111.

[280]During the long period of Spanish and Portuguese colonial empires, neither the clashes between them nor the concluding peace agreements succeeded in resolving the territorial disputes over the River Plate area, which is rich in water resources. Following independence in the early 1800's, Argentina and Brazil fought their last direct conflict in the River Plate region, and resulting 1828 peace treaty established a new buffer state, Uruguay. See, Redick, *et al.*

[281]Redick, *et al.*, pp: 111 - 112.

facility was intended only for peaceful purposes. With the democratic take-over of the regime in Brazil, both leadership agreed to strengthen the *Corpus-Itaipu Agreement*, declaring that mutual inspections of their nuclear facilities was their eventual goal. Hence, in November 1985 Argentina and Brazil signed the *Joint Declaration of Foz do Iguacu* leading to further agreements on economic cooperation and policy integration in the nuclear field.[282] The two nations created a permanent committee on nuclear policy to promote technical and scientific cooperation. This agreement was followed by further joint nuclear policy declarations of *Brasilia* in 1986, *Viedma* in 1987, *Ipero* and *Ezeiza* in 1988, and *Buenos Aires* in 1990. As Goldemberg and Feiveson observed, these achievements are due primarily to the return of democratic rule in both countries after decades of military governments.[283] In November 1990 Argentina and Brazil signed, at Foz do Iguacu, the Declaration on the Common Nuclear Policy of Brazil and Argentina.

The significance of this declaration lies in the decision taken to establish a *Common System of Accounting and Control of Nuclear Materials (SCCC)* to verify that nuclear materials in all nuclear activities of both parties are used exclusively for peaceful purposes. After this declaration, the parties decided to start negotiations with the IAEA to conclude a safeguards agreement based on the SCCC. The two countries equally decided to take initiatives conducive to the full entry into force of the Treaty of Tlatelolco, including action relating to the updating and improvement of the text. The bilateral agreement implementing the Foz do Iguacu Declaration was signed in July 1991 in Guadalajara, Mexico, and entered into force the same year. With this agreement the *Argentine-Brazilian Agency for Accounting and Control of Nuclear Material (ABACC)* is established to administer and implement the SCCC covering an agreed set of nuclear materials. Both Brazil and Argentina have had

282 Marco A. Marzo, *et al.*,
283 Jose Goldemberg and Harold A. Feiveson, *Denuclearization in Argentina and Brazil.*.

safeguards agreements in force with the IAEA since the 1960s and 1970s. These INFCIRC/66 - type safeguards agreements dealt with specific cases of cooperation and did not cover the nuclear materials involved in each country's autonomous programmes. Those then fell under the full-scope safeguards established by the bilateral agreement, subject to the SCCC and verified and monitored by ABACC.[284]

ii... Bilateral Agreement (ABACC) & Basic Undertakings

By signing the bilateral agreement the Argentina and Brazil agreed to use the nuclear material and facilities under their jurisdiction or control exclusively for peaceful purposes. To this end, they agreed *to prohibit and prevent in their respective territories, and abstain from carrying out, promoting or authorizing, directly or indirectly, or from participating in any way in: (1) the testing, use, manufacture, production or acquisition by any means of any nuclear weapon; and (2) the receipt, storage, installation, deployment or any other form of possession of any nuclear weapon.* Bearing in mind that at present no technical distinction can be made between nuclear explosive devices for peaceful or military purposes, both countries also agreed *to prohibit and prevent in their respective territories, and to abstain from carrying out, promoting or authorizing, directly or indirectly, or from participating in any way in, the testing, use, manufacture, production, or acquisition by any means of any nuclear explosive device.* As a basic verification undertaking, the parties agreed to submit to SCCC all the nuclear materials in all nuclear activities under their jurisdiction or control.[285]

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[284] Marco A. Marzo, *et al.*, p. 30.

[285] In addition to the bilateral agreement, the principal documents defining the SCCC are the General Procedures, and the Implementation Manuals for each category of installations. The General Procedures set out the basic criteria and requirements of the SCCC. Chapter 1 contains the criteria and conditions for the starting point of, exemptions from, and termination of safeguards. It also includes general rules for establishing an appropriate level of accountability and control of nuclear materials. Chapter 2 lays down the requirements at the State level for the licensing of nuclear facilities or other locations and the requirements regarding any relevant information for the SCCC, such as the records, the physical inventory, and the traceability of measurement systems. Chapter 3 describes procedures for implementation of the SCCC at the State level. The provisions relating to the implementation of the SCCC by ABACC, are contained in Chapter 4. This includes specifications for relevant information to be provided to ABACC such as: Design Information Questionnaires (DIQ); Inventory Change Reports (ICR); Material Balance Reports (MBR); Physical Inventory Listing (PIL); and notification of transfers out of or between States

iii... Organizational Framework of ABACC

The bilateral agreement gives ABACC the status of an international organization, and its officials that of international civil servants. The organs of ABACC are: the Commission, a governing body consisting of four members empowered to issue the necessary regulations; and the Secretariat, its executive body. The Secretariat is located in Rio de Janeiro, and the position of Secretary alternates annually between an Argentine and a Brazilian. ABACC's technical staff consists of equal number of Argentines and Brazilians. Most of its missions will use personnel drawn from a main pool of about 60 members of the Argentine and Brazilian nuclear agencies, or state-related institutions. The principal functions of the Commission are to: monitor the functioning of the SCCC; supervise the functioning of the Secretariat; prepare a list of qualified inspectors from among those proposed by the Parties; inform the Party concerned of any anomalies which may arise in the implementation of the SCCC; and inform the Parties of any non-compliance with the agreement. Any discrepancy or potential anomaly detected through inspections or evaluation of reports and records must be reported by the Secretariat to the Commission, which must call upon the Party concerned to correct the situation. Consequently, the Secretariat has to perform the necessary activities to implement and administer the SCCC; receive and evaluate the reports; inform the Commission of any discrepancies; and act as the representative of the ABACC. By the late 1992, ABACC had reportedly received initial inventories of all nuclear material and design informations for all nuclear facilities in the two nations. This was verified by on-site inspections, in particular at the Argentine gas diffusion and Brazilian gas centrifuge

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Parties. Chapter 4 also describes in general terms the purposes of inspections and discusses access for inspection and notification about inspections. The general provisions for the evaluation of shipper-receiver differences and of Material Unaccounted For (MUF) are also included in this Chapter. The remaining Chapters contain provisions relating to ABACC inspectors in Chapter 5; Routine Communications in Chapter 6; Document Revision in Chapter 7; Transitional Arrangements in Chapter 8; and finally, Definitions in Chapter 9. There are also: Annex I containing accounting report forms and instructions for their use; and Annex II, containing the Basic System of Routine Communications.

enrichment facilities. These inspections were due to the end of 1993 and, according to Argentine sources, this was accomplished.[286]

iv... The Quadripartite Agreement

The Argentine and Brazilian authorities were well aware that concluding bilateral agreements, though they were very significant steps towards full adherence to the non-proliferation regime, were not enough to assure the international community. Therefore, their confidence-building process that had been under way for about a decade had to be institutionalized. Hence, the IAEA is integrated into this process to further these steps. Accordingly, on December 1991, the Quadripartite Agreement was signed in Vienna, by Argentina, Brazil, ABACC, and the IAEA. This Agreement provides the application of *full-scope safeguards* by the IAEA in cooperation with ABACC, to all nuclear materials and installations subject to bilateral and international agreements. In practice, the Quadripartite Agreement is modelled on the EURATOM-IAEA safeguards agreement, and is therefore equivalent to verification under the NPT. Accordingly, ABACC is given the principal safeguarding responsibility, collecting data and carrying out inspections. The IAEA, on the other hand, has the right to conduct inspections in each nuclear facility, but in practice, works in tandem with ABACC to inspect sensitive parts of the fuel cycle such as uranium enrichment activities.[287] Among the crucial rights given to the IAEA by the Quadripartite Agreement, Article 14, outlining the *Measures in Relation to Verification of Non-Diversion,* affords the IAEA with important *non-compliance* powers. If a state obstructs safeguards, by denying access to an inspection team for

[286]By mid-September 1993, ABACC had reportedly undertaken inspections in slightly less than half the total of sixty nuclear facilities in both countries. See, John R. Redick, *Argentina-Brazil Nuclear Non-Proliferation Initiatives...*

[287]The Quadripartite Agreement gives the IAEA the right to conduct *special inspections* under the same conditions as specified in paragraphs 73 to 77 in the model agreement, namely the INFCIRC/153. Upon the reports produced by ABACC, either at the request of any of the governments or on the basis of ABACC reports that nuclear material may be missing, or if the IAEA decides that ABACC's information is inadequate, such special inspection may be conducted.

example, the IAEA Board can order it to comply. If the state continues to obstruct the safeguards, the Board can then place the situation with the United Nations Security Council, by informing that the IAEA is no longer able to verify the absence of diversion. The Protocol to the Agreement also establishes a *Liaison Committee,* similar to an arrangement between the IAEA and EURATOM, to act as a channel for assessing safeguards concepts and implementation issues. The Committee involves all four Parties to the Agreement and meets annually or at times unusual events occur.[288]

[288]The Committee involves all four Parties to the Agreement and meets annually or at times unusual events occur. Darryl Howlett, *Regional Nuclear Co-operation* ..., p. 67.

PART IV

PROPOSALS FOR STRENGTHENING THE NUCLEAR NON-PROLIFERATION REGIME

CHAPTER IX. SEARCH FOR EFFECTIVE NUCLEAR VERIFICATION: PROPOSALS FOR STRENGTHENING IAEA SAFEGUARDS IMPLEMENTATION.

Since the revelations of the Iraqi clandestine nuclear weapons program which was underway throughout the 1980s; and the more recent safeguards inspections squabble between the IAEA and the North Korean government, the shortcomings of the existing nuclear verification provisions under the NPT and the related safeguards inspections procedures of the IAEA have become much more debated issues among the concerned scholars, scientists and policy-makers.[289] The issues which have created problems in the practice of the IAEA safeguards inspections -for the purpose of verification of the basic undertakings of the states parties to the NPT- need considerable elaboration. Hence, this chapter will, first of all, explore the meaning and the scope, as envisaged by the drafters, of the essential documents that constitute the legal framework of the nuclear non-proliferation regime (e.g., The NPT and the IAEA safeguards agreements). This exploration will display how difficult it may be, in certain cases, to reach a consensus on what these documents do cover. Secondly, and accordingly, under the light of the findings of the preceding discussion, this chapter will investigate the prospects for enhanced verification provisions under the general framework of the NPT as well as prospect for strengthened safeguards inspections procedures of the IAEA that would be adequate

[289]This, however, should not strictly imply that the overall context of the NPT and the IAEA safeguards were totally inadequate or worthless in the past three decades, or that they are useless at present. Quite the contrary, it is well acknowledged that, had there not existed such a legally binding document and a supra-national institution mandated with controlling the development of nuclear energy -even though endowed with limited powers but extended functions- dissemination of nuclear technology and material to the countries which had military aspirations would probably be much more easy. Such countries would reach their aims without confronting serious internationally instituted challenges. In like manner, the quantity and quality of the technical assistance provided to the developing countries would not have attained a considerable level.

for encountering challenges of the *world of new order*[290] towards the next millennium.

A... The Scope of Verification under the NPT: Drafters' Views

The basic undertakings of the states parties to the NPT are indicated in the first two articles of the Treaty. Likewise, verification of compliance with these basic undertakings is accomplished according to the third article of the same document. In a sense, in the first three articles, the drafters of the NPT have determined the norms and the rules that they deemed necessary for preventing further nuclear spread. Therefore, what was envisaged by the drafters of the Treaty regarding the scope of Article III, is certainly important for the researchers as well as for those who are in a position to make suggestions as to how the effectiveness of the nuclear non-proliferation regime can be improved. From time to time, there arise conflicting interpretations of the terms of these articles by different interest groups or states. In such circumstances, securing first hand information from the drafters would certainly contribute to the task of the researchers. Fortunately, with regard to the NPT, of those who have been influencial in finalizing the ultimate wording of the Treaty, George Bunn[291] and Roland Timerbaev[292] have recently worked out a

[290] Since the collapse of the Soviet Union and hence the end of the Cold-War there are new scholarly investigations about what would be the new world order. And, some of the articles are about new world dis-order. However, the author believes that there can be no talk of a world-wide order or dis-order at all, since there is no world-wide confrontation between any two (or more) ideological blocks any more. In the past, two such blocks existed and were led by the United States and Russia both of which were used to extend their spheres of influence to different parts of the globe. Now, rivalry, if it can be said to exist at all, between these two powers can be considered to be on the issue of consolidation of the democratization process in Russia which would (and should) not give way to a renewed threat of nuclear exchange. This is the *order* of the West to its former leading enemy, for sustaining its (Western) financial contribution to that process. Therefore, Russia is now much more concerned with its "near abroad" rather than pursuing world-wide ideological and/or military aspirations. In such circumstances, where world-scale adversaries do not exist, a brand new *world order* is out of mention. Whereas, it would be more logical to elaborate on the *world of new order* which will, according to the author, witness regional power rivalries in different parts of the world without necessarily being explicitly interlinked.

[291] George Bunn was General Counsel of the US Arms Control and Disarmament Agency and a member of the US delegation that negotiated the NPT during the 1960's, becoming Ambassador to the Geneva Eighteen-Nation Disarmament Committee after the NPT was signed in 1968..

[292] Roland Timerbaev, before retiring from the Russian Foreign Ministry, after a forty-year career as a diplomat, has held the post of Russia's Permanent Representative to the IAEA. He also

small but extremely significant study.[293] In their study, which can be considered worthy as a *primary source* in the field of nuclear proliferation, Bunn and Timerbaev aim at clarifying what the drafters of the NPT, including themselves, intended to cover by formulating specifically the verification provisions in Article III of the Treaty. Accordingly, the authors describe the verification powers granted to the IAEA by the language of the NPT, and using the negotiating record of Article III, they identify the basis of the rights ceded by the non-nuclear weapons states to the Agency.[294] In addition, Bunn and Timerbaev demonstrate that the IAEA is authorised to request permission to visit *any* location on the territory of an NPT party in pursuit of this objective, and they assert that, *as a matter of practice not law*, the IAEA inspectors acting under the authority of the NPT did not search for any clandestine weaponization until the disclosure, during and after the Gulf War, of Iraq's nuclear weapons program.[295]

In another separate study, George Bunn similarly argues that the basic purpose of NPT safeguards could be easily thwarted if a non-nuclear-weapon party is able to produce nuclear-explosive material and build bombs in facilities that are not declared to the IAEA and inspected by the Agency inspectors. In his analysis the author attempted to come up with appropriate answers to whether the non-nuclear-

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participated in the negotiations of the NPT, as well as the 1978 Nuclear Suppliers' Guidlines (London Club) and the IAEA's 1971 model safeguards agreements for the NPT (INFCIRC/153).

[293]George Bunn & Roland M. Timerbaev, "Nuclear Verification Under the NPT: What Should It Cover - How Far It May Go", Programme for Promoting Nuclear Non-Proliferation, *PPNN Study Five*, Mountbatten Centre for International Studies, Southampton, 1994.

[294]Such rights that authorize the IAEA to inspect for weaponization, including searching for facilities, locations, equipment or weapon components intended or designed to use, process, contain or be associated with nuclear material.

[295]As a result, the IAEA Board of Governors reaffirmed the Agency's authority to undertake *special inspections* when information provided by the state being inspected was not adequate for the Agency to fulfil its responsibilities to provide comprehensive safeguards in that state. This meant that special inspections could be used to search for clandestine manufacture of nuclear weapons in non-nuclear-weapons states party to the NPT. See, *PPNN Study Five*, ibid., pp: iii - 1. These issues which are still being debated both inside and outside the IAEA will be the task of the following paragraphs in which the legal basis for special inspections as well as the insiders' views (pros and cons) will be highlighted. At this stage, priority will be given to what is meant by the drafters in Article III of the NPT.

weapon states, as they join the NPT, obligate themselves to accept more than the inspection of the peaceful activities they reported to the IAEA ? And, what besides declared nuclear materials and facilities may the IAEA inspectors look at ? As regards whether the IAEA inspectors may inspect undeclared activities where the IAEA can show believeable evidence that: (a) nuclear material (declared or undeclared) may be present ? (b) nuclear material is customarily used in undeclared activities, even though the inspected state says it is not there now? Then the language of the NPT, its negotiating history, and the subsequent agreement applying its safeguards provisions all support the conclusion that non-nuclear-weapon NPT parties agreed to permit inspection activities such as (a) and (b) above.[296]

The key issue is whether the verification article of the NPT is broad enough to authorize IAEA inspections for steps toward weaponization short of final assembly of a weapon. Article III.1 requires safeguards pursuant to an agreement with the IAEA on, "all source or special fissionable material in all peaceful nuclear activities within the territory of such a State, under its jurisdiction, or carried out under its control anywhere." These safeguards are, "for the *exclusive* purpose of verification of the fulfilment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices." According to Bunn and Timerbaev, this language and the safeguards agreements implementing it raise several questions.

[296]George Bunn, "Does the NPT Require its Non-Nuclear-Weapon Parties to Permit Inspection by the IAEA of Nuclear Activities that have not been Reported to the IAEA ?" David Fischer, Ben Sanders, Lawrence Scheinman & George Bunn, *A New Nuclear Triad: The Non-Proliferation of Nuclear Weapons, International Verification and the International Atomic Energy Agency*, PPNN Study Three, Mountbatten Centre for International Studies, Southampton, 1992, pp: 44 - 58.

i... The Purpose of Article III

The first question, according to Bunn and Timerbaev, is whether the Article III's purpose is to verify the Article II obligation *not to manufacture* nuclear explosives, or whether its only purpose is to verify Article III's own language designed *to prevent the diversion* of nuclear energy from peaceful uses to nuclear explosives which was, indeed, a major fear at the time the NPT was negotiated. For the authors, the language of Article III.1 does not say that *only* obligations *prohibiting* diversion to explosives are to be verified. It says obligations, "assumed *with a view to preventing diversion* ..." are to be verified, which is certainly a much broader undertaking. Accordingly, the Article II obligation not to manufacture nuclear explosives was assumed in order, among other reasons, to prevent the diversion of nuclear energy to nuclear explosives. At this stage, Bunn and Timerbaev ask themselves whether the breadth of "with a view to preventing ..." authorize verification of the full scope of the obligation not to manufacture. That obligation, the authors believe, includes a ban on production of components which could only have relevance to a nuclear explosive device even if they do not contain nuclear material. Thus, making prototypes, or even producing or acquiring components especially designed or prepared for nuclear explosive devices, raises a suspicion that the state being inspected may have diverted nuclear material for weapons, or may intend to divert such material.

As a result, the obligation not to manufacture or acquire prototype devices or components uniquely related to nuclear weapons is one that can easily be said to have been "assumed with a view to preventing diversion ..." Evidence of such weaponization steps can, therefore, trigger IAEA requests for additional information or special inspections. Hence, the conclusion that the language of *Article III.1 is broad enough* to authorize inspections for steps towards weaponization is confirmed by its negotiating history which clearly shows that, *its main purpose was to provide safeguards* *to verify adherence to the Article II obligation not to manufacture nuclear explosive devices.*[297]

ii... Safeguarding Non-Nuclear Components: Are They Accessible ?

The criteria for determining whether an activity constituted manufacture depend, first of all, on whether the activity could only have relevance to a nuclear explosive device. And, secondly, whether the purpose of the activity derived from all available evidence was to make a nuclear device. Assuming the answer to either of these questions was yes, a violation of Article II of the NPT would occur whether or not nuclear material was present. But, the model safeguards agreement INFCIRC/153 does not require reporting of nuclear components. *Nuclear material, not other components, is the focus of safeguards as this is what must be accounted for.*[298] Moreover, it has not been in the practice of IAEA inspectors to search for weaponization activities. Consequently, a second question arise as whether Article III of the NPT, and the safeguards agreements interpreting it, authorize the IAEA to seek out special inspections when weapon prototype testing or other weaponization experiments are suspected ?[299]

Regarding this, George Bunn and Roland Timerbaev note that, Article III and the safeguards agreements focus primarily but not exclusively on nuclear material. They further iterate that, Article III's first sentence requires safeguards for the purpose of verifying NPT obligations assumed with a view to preventing diversion of *nuclear energy.* The second sentence says that the safeguards required by the first apply with respect to "source and special fissionable material ..." The third says these safeguards "shall be applied on all source and fissionable material ..." Hence, except for the reference to nuclear energy in the first sentence of Article III, which describes

[297]Bunn & Timerbaev, ibid., pp: 1 - 10.
[298]See, INFCIRC/153 paragraph 1, and paragraphs 62 - 69.
[299]Bunn & Timerbaev, ibid., p. 12.

the purpose of safeguards, the object of all this language is nuclear material. However, nuclear energy was used in the first sentence because it is *broader* than nuclear material.[300] While this does not negate the primary focus of Article III on nuclear material, it does suggest that inspecting and accounting for such material need not be the only function of the IAEA safeguards. Indeed, it suggests, according to the authors, *a broader search for components besides nuclear material* that can contribute to fission or fusion. Moreover, the authors assert, none of Article III's sentences say that the only places that may be inspected are those where nuclear material is present. Hence, *while the main focus of Article III is on safeguarding nuclear material, its language does not preclude inspecting items that do not contain such material.*[301]

B... Legal Basis for Special Inspections in the IAEA Documents

The procedural matters that relate to the mandate of the IAEA in implementing safeguards inspections are, in most part, clearly stated in the Statute of the Agency as well as the safeguards documents currently in force namely, INFCIRC/66 or INFCIRC/153. There are, however, several points which are still elusive in these documents, especially those relating to the right of the IAEA to conduct particularly *non-routine*[302] inspections in the declared or undeclared sites in the states that are party to the NPT. The INFCIRC/153 stipulates that the IAEA shall have the right to make inspections as provided in paragraphs 71 through 82 of that document. In

[300] The dictionary meaning of energy, as the authors note, includes both power and the resources for producing such power. In the case of nuclear energy, it encompasses both nuclear fission or fusion and the nuclear materials which fission or fuse. Bunn & Timerbaev, ibid., p. 13.

[301] For example, Iraq is believed to have tested hollow spheres of high explosives that contained non-explosive material. This conduct is hard to justify for any other purpose than weapon building. It would also be an item that was intended to contain or use nuclear material. Hence, upon this information, according to the author, the IAEA authorities should have asked special inspection from their Iraqi counterparts, which would perhaps disclose Iraq's nuclear weapons programme much earlier. Bunn & Timerbaev, ibid., p. 14.

[302] A non-routine inspection means any inspection which is not pre-scheduled by the Agency and the states parties to the safeguards agreement.

general terms, it is stated that the Agency may make *ad hoc*[303], *routine*[304], and *special*[305] inspections in order to verify the information contained in the reports submitted to the Agency by the national institutions established in each state party to the NPT, as required in the safeguards document, for running a State System of Accounting and Control of Nuclear Materials.

On the account of conducting special inspections, **paragraph 73** reads as follows: "The [Safeguards] Agreement should provide that the Agency may make special inspections subject to the procedures laid down in paragraph 77 below: ... (b) If the Agency considers that information made available by the State, including explanations from the State and information obtained from routine inspections, is not adequate for the Agency *to fulfil its responsibilities* under the Agreement. An inspection shall be deemed to be special when it is either *additional to the routine inspection* effort provided for in paragraphs 78-82 below, or involves *access to information or locations in addition to the access specified in paragraph 76* for ad hoc and routine inspections, or both" (emphasis added).

Accordingly, **paragraph 77** reads as follows : "As a result of [the] ... consultations [between the Agency and the State] the Agency may make inspections in addition to the routine inspection efforts provided in paragraphs 78-82 ..., and *may* obtain access in agreement with the State to informations or *locations* in addition to the access specified in paragraph 76 above for ad hoc and routine inspections. Any *disagreement* concerning the need for additional access shall be resolved in accordance with the paragraphs 21 and 22; in case action by the State is essential and urgent, paragraph 18 above shall apply" (emphasis added).

303 Paragraph 71.
304 Paragraph 72.
305 Paragraph 73.

As for the **paragraph 76(c)**, according to which *ad hoc* and *routine* inspections are carried out, it is stated that "[f]or the purposes specified in paragraph 72 above the Agency's inspectors shall have access only to the *strategic points* specified in the Subsidiary Arrangements and to the records maintained pursuant to paragraphs 51-58..." That clause well displays the limitations imposed upon the inspections of the IAEA.

Under the heading of Interpretation and Application of the Agreement and Settlement of Disputes, the **paragraph 22** reads as follows: "The Agreement should provide that any *dispute* arising out of the interpretation or application thereof except a dispute with regard to a finding by the Board [of Governors] under paragraph 19 above or an action taken by the Board pursuant to such a finding which is not settled by negotiation or another procedure agreed to by the parties should, on the request of either party, be submitted to an arbitral tribunal composed as follows: each party would designate one arbitrator, and the two arbitrators so designated would elect a third, who would be the Chairman. If, within 30 days of the request for arbitration, either party has not designated an arbitrator, either party to the dispute may request the President of the International Court of Justice to appoint an arbitrator. The same procedure would apply if, within 30 days of the designation or appointment of the second arbitrator, the third arbitrator had not been elected. A majority of the members of the arbitral tribunal would constitute a quorum, and all decisions would require the concurrence of two arbitrators. The arbitral procedure would be fixed by the tribunal. *The decisions of the tribunal would be binding on both parties.*

The **paragraph 19**, on the other hand, which relate to the findings of the IAEA Board of Governors states that "if the Board upon the examination of relevant information reported to it by the Director General finds that the Agency is *not able to* *verify* that there has been no diversion of nuclear material required to be safeguarded under the Agreement to nuclear weapons or other nuclear explosive devices, it may make the reports provided for in paragraph C of Article XII of the Statute and may also take, where applicable, the other measures provided for in that paragraph. In taking such action the Board shall ... afford the State every reasonable opportunity to furnish the Board with any necessary reassurance."

Accordingly, the **Article XII.C** of the Statute reads as follows: "...The inspectors shall report any non-compliance to the Director General who shall thereupon transmit the report to the Board of Governors. The Board shall report the non-compliance to all members and to the Security Council and General Assembly of the United Nations. In the event of failure of the recipient State or States to take fully corrective action within a reasonable time, the Board may take one or both of the following measures: direct curtailment or suspension of assistance being provided by the Agency or by a member, and call for the return of materials and equipment made available to the recipient member or group of members. The Agency may also, in accordance with Article XIX, suspend any non-complying member from the exercise of the privileges and rights of membership."

Regarding the right of the Board of Governors to suspend the privileges and membership of any of its Member States, **Article XIX.B** states that "A member which has *persistently* violated the provisions of this Statute or of any agreement entered into by it pursuant to this Statute may be suspended from the exercise of the privileges and rights of membership by the General Conference acting by a *two-thirds majority* of the members present and voting upon recommendation by the Board of Governors" (emphasis added).

One final article that should be noted here in order to complete the picture of the legal basis in the IAEA documents which pave the long way to special inspections is the **paragraph 18** of INFCIRC/153. In that paragraph it is stated that "... if the Board, upon the report of the Director General, decides that an action by the State is essential and *urgent* in order to ensure verification that *nuclear material* subject to safeguards under the Agreement is not diverted to nuclear weapons or other nuclear explosive devices the Board shall be able to call upon the State to take the required action without delay, irrespective of whether the procedures for the settlement of a dispute have been invoked" (emphasis added).

C... Seeds of Change in Safeguards' Mode of Implementation

From the above paragraphs and the cited articles of the legal documents, it can safely be concluded that, the IAEA Board of Governors is indeed given the necessary authority, to dispatch an inspecting team into a suspect state whenever it deems necessary in order to investigate about the unusual activities. However, since that authorisation was not unequivocal, it has therefore never been materialised.[306] This issue has been, from time to time, severely criticised by several concerned scholars and scientists. Those who were critical about non-conducting special inspections by the Agency in the states that they believed clandestine activities were underway, have faced the opposition of another group of scholars and scientists. Those in opposition to the criticisms argued that according to the annual Safeguards Implementation Reports (SIR) of the Agency, no such a necessity arose at all. Proponents of this point of view have further argued that, any demand of the Agency from a state for carrying out special inspections short of reliable and indisputable information about the would-be clandestine activities of that state would severely deteriorate the image and the prestige of the Agency especially in

[306]One exception to this, if it can be considered in the same legal framework at all, was the creation of the United Nations Special Commission (UNSCOM) for implementing the terms of the UN Security Council Resolution 687 (1991).

the eyes of the developing states. This debate has not fully settled yet, though the balance has fairly shifted towards the side of those who were and still are critical about the attitude of the Board of Governors and the Secretariat of the IAEA. There are however signs of change in this attitude of the Agency. But, apparently, the pace of change is observed to be far slower than expected or needed. At this stage, it would be wise to refer to the views of the former and the present officials of the IAEA about the composition and the administration of the reforms in safeguards implementation in the wake of the revelations about Iraq.

i... Insiders' Views: "IAEA's Management Culture Must Change..."

David Kay, who was with the IAEA from 1983 until 1992 and served as Chief Inspector for three of the early post-Gulf War nuclear weapons inspections in Iraq that uncovered the extensive clandestine nuclear program, asserts that "[t]he first priority in any effort to strengthen safeguards must be to begin with a change in the organisational culture and management ethos of the IAEA."[307] According to Kay, Iraq demonstrated that the IAEA's previous policy of exclusive concentration on material balance accounting could not effectively address the issues of detecting even a large-scale clandestine program centered physically and managerially within Iraq's declared civilian program.[308] Until the discoveries were made in Iraq, the IAEA was optimistic and, as criticised by Kay, was very self-congratulatory in describing safeguards.[309] Similarly, Lawrence Scheinman, who has served on the staff of the IAEA as a special advisor to the Director General of the Agency, criticises the

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[307]David Kay, "The IAEA: How Can It be Strengthened ?", in Mitchell Reiss & Robert S. Litwak (eds.), *Nuclear Proliferation after the Cold War*, The Woodrow Wilson International Center for Scholars, Washington, 1994, pp: 309 - 333.

[308]The point that David Kay is the most critical about is that, the IAEA inspectors who visited Iraq's Tuwaitha Nuclear Research Center every six months never looked beyond the narrow confines of the three material balance areas where declared materials were held, never asked what might be going on in the other seventy-plus buildings on the same site, never attempted to visit any but the three areas where declared nuclear materials were held, and never tried to sample the radioactive waste areas. See, David Kay, ibid., p. 314.

[309]See, Jon Jennekens, "IAEA Safeguards: A Look at the 1970-1990 and Future Prospects," *IAEA Bulletin*, 1/1992, p. 10.

managerial body of the IAEA for being more conservative, more cautious, and less aggressive than the Agency should be. Conservatism and self-constraint, according to Scheinman, became internalised to the extent that the Agency occasionally gave more ground in negotiating subsidiary arrangements that regulate the operational side of the safeguards than was necessary. He, therefore, asserts that, in such a state of affairs, the inspectors were not encouraged to raise questions about activities or structures outside defined strategic points when conducting routine inspections, based on the belief that "asking too many questions would lead to difficulty with the state, and ultimately at headquarters."[310]

Despite the trauma experienced by the IAEA right after the Gulf War, the events in Iraq, according to Kay, have not completely washed away the former "mind-set" and organisational culture of the Agency. As a proof of his assertion, Kay puts forward the way the IAEA has reacted to the growing allegations about undisclosed nuclear activities in Iran. Hence, Kay argues that, it was a good opportunity for the four senior IAEA staff members headed by Jon Jennekens, the Deputy Director General for Safeguards, to demonstrate that the Agency had learned the following lessons from Iraq:

1...to look beyond the narrow confines of safeguards data;

2...to seek out and use information from the press and intelligence sources;

3...to be sensitive to the many opportunities that a skilful proliferator has for engaging in deception activities;

5...to indicate that the Agency understood that safeguarding only declared facilities was inadequate; and

6...to be careful about drawing sweeping conclusions of innocence from quick, superficial visits.[311]

[310]Lawrence Scheinman, Occasional Paper, Atlantic Council, p. i., quoted in David Kay, ibid., pp: 316 - 317.
[311]David Kay, ibid., p. 317.

But in the following words of Jennekens, traces of lesson-drawing from a recent traumatic experience can hardly be detected:

"We have reviewed some of the media coverage of the activities alleged to take place in Iran and we are very pleased to confirm that there doesn't seem to be a shred of evidence of any of these misleading misinterpretations. Everything that we have seen is for the peaceful application of nuclear energy. ... As to the possibility of the non-peaceful use of Bushehr, we are very confident that the *existing safeguards systems of the Agency is fully adequate to provide convincing evidence* on a continuing basis that declared facilities are being used only for the stated purpose"[312] (emphasis added).

The point to be utmost critical in Jennekens' statement is not the positive approach of the IAEA staff members to the Iranian nuclear program. Since, for the time being, Iran may not be in a position to reveal any sign of military aspirations at all in building up their Bushehr site.[313] However, what is annoying in the above statement is the lack of suspicion and the still extremely self confident attitude of IAEA authorities in the wake of Iraqi affair even knowing how the Iraqi side

[312] From the press conference of Jon Jennekens held on February 12, 1992 in Tehran, following the six-day visit of IAEA staff members to Iran for carrying out special inspections with no restrictions and no limitations. Quoted in Kay, ibid., pp: 317-318.

[313] In addition to formal declarations of the Iranian government authorities, in personal conversations with the Iranian scholars and diplomats during an international conference in Sweden in June 1995, Dr. HadjiHusseini of the Tehran based Institute for Political and International Studies (IPIS) told the author that Iran was undergoing a serious economic crisis since the drastic falls in the oil prices, and also suffered a considerable decline in the generation of electrical energy. Hence, Iran, according to Dr. Hadjihusseini, has no other option but to revitalize its already $ 4 billions spent Bushehr project initiated by the Germans but not terminated. Notwithstanding this explanation, the former CIA Director James Woolsey stated, in September 1994, that they paid particular attention to Iran's efforts to acquire nuclear and missile technology from the West in order to enable it to build its own nuclear weapons. Woolsey also noted that Iran is 8 to 10 years away from building such weapons and that help from outside will be critical in reaching this timetable. According to Woolsey, Iran has been particularly active in trying to purchase nuclear materials or technology from Russian sources, as well as looking to purchase fully fabricated nuclear weapons in order to accelerate sharply its timetable. See, "Challenges to Peace in the Middle East," Address of R. James Woolsey to the Washington Institute for Near East Policy, Wye Plantation, MD, September 23, 1994, quoted in Leonard S. Spector, Mark G. McDonough with Evan S. Medeiros, *Tracking Nuclear Proliferation: A Guide in Maps and Charts, 1995,* Carnegie Endowment for International Peace, Washington D.C., 1995. p. 119.

successfully deceived the well-trained inspector teams, and achieved to cover their nuclear weapons program from the world community for more than a decade.

The totality of a nation's nuclear activities and determining whether any of these activities are directed toward non-peaceful ends should be as important for the IAEA authorities as achieving greater accuracy in accounting for declared nuclear material in the declared nuclear sites. If the scholarly circles were to completely agree with Jennekens's line of thought that the "existing safeguards systems of the IAEA were fully adequate to provide convincing evidence", then this study would be groundless. The restrictions and limitations in the mandate of the IAEA have been repeatedly pointed out in this study. Nevertheless, even with its present mandate, the IAEA would probably do more by making use of some investigation techniques (e.g., environmental sampling -air, water, soil investigation), and hi-tech instruments (e.g., practical handhold global positioning satellite GPS which gives one's location with an accuracy of ten meters or less). Taking into consideration that, throughout the 1980s the IAEA Board of Governors included such Member States as India, Pakistan, China, Argentina, Brazil, Iraq, Iran, Libya, and Syria, the inability and/or the reluctance of the Board, in the past, to take prompt measures against allegations and to adapt new methods within the limits of the terms of the legal documents is not difficult to understand.

Whereas, the current safeguards practice severely limits the equipment that an inspector may bring to a nuclear site, and that the inspectors have been discouraged by the Agency from taking samples and measurements at locations other than the strategic points set out in the individual Facility Attachments, in a recent study undertaken within the Agency to reinvigorate its safeguarding power, (i.e., the Programme 93+2) it is clearly stated that the Secretariat is proposing the use of environmental monitoring techniques for gathering broader information on states' nuclear activities in order to achieve greater nuclear transparency.

ii... "Programme 93+2": a Panacea ?

The effective inspections carried out in Iraq under the UN Security Council Resolution 687 has led to the consideration of whether the broad, but previously unexercised, rights of the IAEA under basic NPT safeguards agreements could not be used to carry out inspections beyond the routine inspections directed toward known declared activities. The Secretariat of the IAEA, after examining this issue, concluded that all along this right had indeed existed, and the Board of Governors in February 1992 agreed with this finding.[314] Withstanding this line of thought, throughout the 1990's, the IAEA has focused extensively, as reported by Richard Hooper from the Department of Safeguards of the IAEA, on measures to make the safeguards system more effective and efficient. The major effort in this undertaking is called the "Programme 93+2", the IAEA's programme to develop and test a comprehensive set of measures to improve safeguards implementation. The formal title of the programme is "Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System". The programme formally began with the IAEA Board of Governors' endorsement of the proposed effort in December 1993 and is sought to be completed within two years. According to Hooper, the initial goal of the IAEA Secretariat was to present the Board with the technical, legal and financial implications of a fully integrated and tested set of measures for strengthened, more efficient safeguards prior to the April 1995 NPT Review and Extension Conference. The measures, aimed at giving the IAEA increased access to relevant information

[314]According to David Kay it is not certain yet whether this is more than a symbolic victory, since no such inspections have been carried out. Kay furthermore argues that, given the politics of the IAEA and the Board of Governors, it is difficult, for example, to imagine that the Director-General would have authorized seven successive special inspections to Iran in three months if the first three had found nothing. Kay also notes that, in the case of Iraq, inspections have been frequent and with no certain end in sight. Unsuccessful inspections have quickly been followed by others, and then successfully uncovered the entire nuclear program of that country. See, David Kay, ibid., pp:324 - 323.

and sites -without dramatic cost increases- have undergone testing in a number of Member States directly involved in the process.[315]

The Iraqi experience, and in some ways more importantly the inspections in South Africa (following the declaration that the South African government abandoned its nuclear weapons programme and that it decided to accede to the NPT) have played a central role in efforts to strengthen safeguards. Iraq, as Hooper notes, provided an important lesson because it helped demonstrate the breadth of information and access needed to credibly address the completeness issue (i.e., assumption that declarations about the nuclear materials was complete). South Africa, on the other hand, helped to demonstrate what is possible when both sides honestly address nuclear transparency and openness. The conceptual development of Programme 93+2 is based on the notion that the level of assurance a safeguards system provides depends ultimately upon two key attributes: *coverage* and *continuity*. Coverage involves the extent to which safeguards relevant materials and events are effectively subject to verification. Continuity addresses the extent to which the status of the whole continuum of relevant materials and events can be inferred from verification of single parts.[316]

Programme 93+2 builds on the current system of material accountancy and control by integrating the present system's best elements with increased access to information and its effective use by the Agency plus increased physical access for inspections. New proposals, and the measures already adopted, relate to three main areas of reform:

[315] Richard Hooper, "The Objectives of Programme 93+2", IAEA Seminar on *Verifying Nuclear Non-Proliferation and Disarmament Pledges: Future Directions for the IAEA Safeguards*, Vienna, Austria, December 1995.
[316] Hooper, ibid., p.3.

1...Those that strengthen the IAEA's *access to information* include:

...) an enhanced declaration of nuclear facilities by all nations which have signed a comprehensive safeguards agreements with the IAEA. While current safeguards focus on safeguarding nuclear material, this enhanced declaration will compel parties to provide descriptions of all nuclear related facilities including those used for research and development, production, and training.[317]

...) greater use of publicly available data on nuclear activities through increased use of data acquisition, processing and evaluation. An enhanced effort in collecting and analysing data from IAEA, public and government sources is proposed as a relatively low cost and useful method of assessing nuclear activities;

...) early access to design information on declared facilities; and

...) new reporting scheme on export and import of nuclear material and specified equipment.

2...Those related to increased physical *access to sites* include:

...) *unrestricted* access to nuclear and nuclear-related sites. This would entail inspection techniques such as "managed access" to protect commercially sensitive information;

...) access beyond nuclear and nuclear-related sites arranged case by case to follow up on information or to implement technical measures; and

...) using the existing right to access on short notice or no-notice during routine inspections.

3...Those related *rationalisation & administrative streamlining* include;

...) expanding the use of the IAEA's two regional safeguards offices in Tokyo and Toronto;

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[317] See, "Nuclear Proliferation", the *Draft Information Document*, issued by the Scientific and Technical Committee of the North Atlantic Assembly (NATO Parlamentarians), AM 310, STC (95) 10, October 1995, p. 9.

...) partnership agreement with EURATOM Inspectorate;

...) a proposal for simplified designation procedures for inspectors;

There are also measures relating to the use of environmental monitoring. Experience in Iraq has confirmed that environmental samples from rivers, the atmosphere etc. can reveal a great deal about nuclear activities, and the IAEA has conducted a series of pilot studies elsewhere. These have indicated that sampling can uncover important features about nuclear activities being conducted and that samples can be taken under existing safeguards agreements.[318]

Other measures under consideration include:

...) reducing the frequency of inspections at light-water reactors;

...) greater use of unattended measurement and surveillance equipment with remote transmission data from monitors such as cameras and motion detectors which could alert the IAEA instantly to events at facilities under safeguards;

...) multiple entry visas for inspectors; expanded capability for inspectors to communicate with headquarters;

...) additional regional safeguards offices to safe travel costs and facilitate short notice and non-notice safeguards inspections;

...) expanded training of inspectors;

...) revision of safeguard parameters;[319]

...) joint use of equipment and laboratories by the IAEA and State Systems of Accountancy for and Control of Nuclear Materials (SSAC);[320]

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318 See the NATO document, ibid., pp: 9 - 10.

319 The IAEA is looking at the definitions of "significant quantities" of fissile material and "conversion times" to see if these have kept pace with progress in the technologies of weapons manufacture. For details see Appendix B of this study.

320 See the NATO document, ibid., p. 10; and Richard Hooper, op cit., p. 4.

iii... Proceedings of the "Programme 93+2"

At a four-day meeting in late March 1995, the IAEA Board of Governors considered the set of proposals by the Agency's Secretariat (Programme 93+2) for a strengthened and cost-effective safeguards system. After long debate, the Board reportedly endorsed the direction of the "Programme 93+2", reaching consensus on the General thrust of the proposed new system, which should provide for verification by the Agency of the "correctness and completeness" of declarations by states party to comprehensive safeguards agreements, so that there is credible assurance of the non-diversion of nuclear material from declared facilities and of the absence of undeclared activities. Reportedly recognising that a strengthened safeguards system would require states to grant the Agency greater access to information and locations than had previously been required, the Board asked the Secretariat to submit for consideration at its meeting in June 1995 specific proposals on the implementation of the Programme, preparatory to presentation to the General Conference of the IAEA, in September 1995. Some Board members are said to have expressed reservations about the need for greater access to sites and to have argued that the proposed extensions were going too far.[321]

The proposals duly submitted by the Secretariat for the June Board are understood to have been in two parts. With respect to activities for which the Agency's Secretariat believes existing instruments, notably the safeguards agreements based on document INFCIRC/153, give it the necessary authority, and which it would be practical and useful to implement at an early date, specific implementation measures were proposed. For those measures for which the Secretariat thinks it does not now have express authority, it presented proposals for implementation through additional authority that would complement that given in

[321] Programme for Promoting Nuclear Non-Proliferation, *Newsbrief*, Second Quarter 1995, No: 30, p. 9.

the safeguards agreements. The former part is understood to include the collection of environmental samples at sites where the IAEA already has the right of access; the acquisition of information for which it has not previously asked, including parts of fuel cycle that precede the introduction of safeguards material into a reactor or enrichment facility, such as mining, processing and conversion plants; and information on past operations. It is said to be the Director General's intention that a start should be made right away with the implementation of those measures. Even so, some measures that come within part of the Programme may require negotiation. An example is increased cooperation with states' systems of accounting and control, on which the Agency seeks more information, which it feels it has the right to ask for, while some states may need persuasion to provide it.[322]

With regard to the second part of the Programme, where the Secretariat sees a need for extended access to locations and information, the Board has asked the Secretariat to present for discussion at its December 1995 meeting, *model legal documents* through which it would be given the necessary *additional authority.* It seems that the Board is divided on the nature of the legal mechanism that would be required. Some governors are said to favour the preparation of draft protocols to existing safeguards agreements, or a revised version of the model safeguards agreement, either of which would first have to be formulated in general terms and subsequently negotiated for formal adoption with each of the states concerned. Other governors apparently think that the matter might be settled in a state-by-state arrangements, which presumably would take less time to conclude. Activities for which the Secretariat apparently considers it necessary to obtain such additional authority include declarations of, and physically access to, locations where the state has declared that activities are carried out that are "functionally" related to fuel cycle operations; an example given is heavy-water production. Another issue is that of

[322]Ibid.,

obtaining full access to sites where a state has identified nuclear materials to be present; environmental sample collection would be done at the site, not just the facility. Yet another area that would reportedly come under the second category of measures is an expanded declaration, giving a complete description of the nuclear fuel cycle.[323] Reportedly, a number of states' representatives, including those from countries in the Middle East, which fear they may be targeted by the new procedures, as well as some of the more highly industrialised Western states, have objections to the increased intrusiveness of the Agency's safeguards system.[324]

323Ibid.,
324Programme for Promoting Nuclear Non-Proliferation, *Newsbrief*, Third Quarter 1995, No: 31, p. 12.

CHAPTER X. SUPPLEMENTARY MEASURES FOR HINDERING STATES FROM ACQUIRING NUCLEAR WEAPONS CAPABILITY

A... Overview

By adhering to the nuclear non-proliferation regime, states have in a way promised the international community that they would behave in conformity with the principles and the norms of the regime, and that they would abide the rules set forth within the regime framework. This, however, would not be sufficient for preventing a state from acquiring nuclear weapons capacity through various means in case a hidden political will existed in the leadership of that state. The previous chapter displayed how difficult it may be in some instances to verify that states party to the NPT do fully comply with their basic undertakings. The implication of this is that, the legal documents may be effective only up to a certain degree, and beyond that level some other measures may be required in order to effectively prevent the proliferation of nuclear weapons. A further deduction from this implication, therefore, would be to propose ***making it a difficult process, by other means, for the states (either party to the NPT or not) to acquire the capacity to manufacture nuclear explosive devices.*** Hence, this chapter will elaborate on what could be such measures that would ultimately contribute to the operationalization of the principles and the norms of the nuclear non-proliferation regime even though these measures may not be necessarily linked to the regime by any legal documents or so. The implicit aim of these measures should be ***to raise the hurdles, that a proliferator state would have to jump, at every stages of the process of manufacturing nuclear explosive devices.***

As it is also described in the Appendices in sufficient detail, acquiring the fissile material is essential for the manufacture of nuclear explosive devices. Therefore,

setting tight controls on the transfers of fissile as well as dual-use materials between the states would certainly make it difficult to acquire the materials needed, unless their destinations to peaceful uses can be definitely identified. Increasing the effectiveness of the export control measures, which are indeed in force (so to speak) for decades, as well as making them more up to date regarding the changing political environment is an issue that should be seriously considered. At that point, the importance of reliable intelligence also reveals itself. Because, in order to determine the actual destination of a nuclear material acquired, either from the IAEA or from the international nuclear market, the political will behind procuring such material should be determined by means of accurate and reliable intelligence. But, since intelligence gathering facilities (e.g., satellites etc.,) are rather scarce in number and they are mostly concentrated at the disposal of a small group of states, then the question of ***how to make the supply of dependable information to the IAEA authorities about the suspected activities of several states in the nuclear market*** is also an issue which should be seriously dealt with.

In addition, availability of especially the fissile material, which is *sine qua non* for nuclear explosives, should be considerably limited. Abundance of fissile materials in the international market, which is the case today, would certainly make their safe storage highly difficult. Regarding the tremendous amounts of fissile material, particularly Plutonium available at the disposal of several states,[325] ***a cut-off in the production of fissile material would also contribute to preventing states from manufacturing fission weapons.***

Furthermore, since nuclear weapons are the products of a series of extremely sophisticated processes, they ultimately require, among other things, testing their

[325]Either the plutonium that is still being produced in the operating reactors, or the plutonium obtained from the dismantlement of nuclear warheads.

reliability. Accordingly, effective limitations on testing the nuclear devices would lower the credibility and thus deterrence capacity of such a device both for the manufacturer country and their would-be target countries. Hence, so would the political will of states be less in that regard. Thus, ***putting into force a comprehensive ban on nuclear tests would probably contribute to the non-proliferation cause.***

Moreover, the motives behind the will of those states which have opted for seeking a nuclear weapons potential to be at their disposal are, to some extent, related to their security considerations vis-à-vis their geo-political environments. Comprehensive studies in these respects demonstrate, though not statistically, the existence of such a correlation.[326] Therefore, making those states feel safer may necessitate strong assurances from the nuclear capable states that they will not be threatened by the existence of these weapons, and that these states will help them in case there emerges a nuclear threat to their state-survival from the third countries. Hence, ***providing reliable security assurances by the existing nuclear powers to the non-nuclear states would most probably demolish any will of these states for acquiring nuclear weapons capacity for the sake of securing their survival.***

This chapter will therefore search for the feasibility of the suggested measures, enumerated above, with regard to their possible contributions to an enhanced nuclear non-proliferation regime. Brief investigations about the past and the present state of affairs of these issues may be necessary for drawing inferences about what is likely to be achieved in the future.

B... Nuclear Export Controls

The desired objective for export controls is to reduce the possibilities for transferred items being used in nuclear weapons, not to restrict international trade

[326] See for example the books by Leonard S. Spector *et al.*, cited in the footnotes.

between the industrial and developing nations.[327] With the 'Atoms for Peace' speech of Eisenhower, the peaceful development and the dissemination of nuclear energy required the controlled transfer of materials and dual-use items among the states. This issue has also been envisaged in the NPT, particularly in the terms of Article III, 2 as: " *Each State Party to the Treaty undertakes not to provide ... (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this Article.*"

It is, however, interesting to note that this Article specified that safeguards were required only on *equipment which was especially constructed for nuclear purposes.* Hence, the export of dual-use items (i.e., an item which might be used for both nuclear and non-nuclear purposes) would be exempted from international controls. This was a weakness of the Treaty. There was furthermore no consensus among the states on what would be the equipment that required Agency controls. A number of sensitive technologies relating to fuel reprocessing and enrichment were initially excluded from the control list. The difficult task of agreeing upon an export control list that would plague the leaks of Article III(2) was originally undertaken by the Zangger Committee and the the Nuclear Suppliers Group.

i... The Zangger Committee

The Zangger Committee[328] is one of the regime elements spawned by the NPT. It is established in 1971, a year after the NPT's entry into force, by a group of

[327] See the note of the editor. Harald Müller and Lewis A. Dunn, *Nuclear Export Controls and Supply Side Restraints: Options for Reforms*, PPNN Study Four, Programme for Promoting Nuclear Non-Proliferation, Southampton, UK, October 1993, p. iii.
[328] Since the representatives of the states party to the NPT that were significant exporters of nuclear plant or material had begun to meet informally in 1971 under the chairmanship of the Swiss Professor Claude Zangger, the Committee is therefore associated with the name of the Prof. Zangger.

NPT signatories who were also major nuclear suppliers. The purpose of the Committee was to flesh out the vague requirement of safeguards on export of nuclear equipment and material contained in Article III.2. The Zangger Committee made two influential statements to this end. First, it determined that full-scope safeguards were not required by Article III.2. Exporters needed only to ensure that safeguards arranged for a particular export rather than for the importing nations' entire program. Second, the Committee developed a *trigger list,* also known as the *Zangger list* of items of nuclear equipment and material that require safeguards as a condition of export. At present, all twenty-nine Zangger Committee members[329] voluntarily commit themselves not to export trigger list items unless the importer has arranged for international safeguards on them. Hence, the Zangger list is widely regarded as a significant contribution to the non-proliferation regime.[330]

ii... The Nuclear Suppliers Group Guidelines (The London Club)

The 1974 Indian nuclear blast[331] shocked the West and led the major nuclear suppliers to question the adequacy of the NPT for regulating the flow of nuclear materials and technology. This concern led to the creation of Nuclear Suppliers Group (NSG)[332] to further restrict the supply of items that might be used to

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[329] The original body of the Zangger Committe consisted of the USA, the Soviet Union, the United kingdom, France, F. R. Germany, Canada and Japan. Eventually, the Committee enlarged to include Australia, Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Poland, Norway, Portugal, Romania, Slovakia, Spain, South Africa, Sweden, Switzerland (recently Russia took over the seat of the Soviet Union).

[330] See, Garry T. Gardner, 1994, *Nuclear Nonproliferation : A Primer*, Lynne Rienner Publishers, Boulder & London.

[331] In 1974 the Indian government officially announced that its scientists had tested a nuclear explosive device at Pokharan in Rajasthan. It is noteworthy that if the Pokharan test had taken place before 1 January 1967, India would have been one of the officially recognized nuclear-weapons state under the Article IX. 3 of the NPT. India was thus the first country to use a civilian nuclear plant to make the material for a "reportedly peaceful" nuclear explosive device.

[332] The Nuclear Supplier Group has reproduced a set of guidelines that most of the suppliers of nuclear plants and materials agreed to in London on 21 September 1977. That`s why this group is equally known as the London Club. This set of guidelines is also attached to communication addressed on 11 January 1978 to the Director-General of the IAEA. These guidelines for nuclear transfer are also labelled as INFCIRC/254. The initial signatories of the guidelines are; Belgium, Canada, Czechoslovakia, France, the former German Democratic Republic and the Federal Republic of Germany, Italy, Japan, the Netherlands, Poland, Sweden, Switzerland, UK, USA and the USSR.

advance a non-peaceful nuclear program. The NSG required export conditions stricter than those specified in the NPT. The London Guidelines differ from those of the Zangger Committe in many respects. They included addional items, particularly heavy-water technology, and requested that suppliers should exercise restraint over exports of sensitive technologies and materials (defined as the production of heavy-water, enrichment, reprocessing, and weapons-grade fissionable material). Commitments were required to place replicas and re-exports of transferred technologies under safeguards constraints. Guarantees of peaceful use and adequate physical protection were also requested from importing states.[333]

iii... Weaknesses of the Recent Export Controls

Although there was broad agreement among the nuclear exporters over the guidelines, they were unable to agree on the principle of full-scope safeguards of the IAEA as a condition of supply. Prior to the early 1990's, progress on reducing the weaknesses within the export control system based on the NPT was limited. With regard to their export policy objectives, several exporting states such as France, Belgium, Switzerland, F. R. Germany, Italy, Spain, and the Soviet Union were still concerned with achieving a compromise between commercial and non-proliferation interests. The real proliferation risk posed by the recipient country was of almost no importance. Whereas exports of nuclear technology by the Co-ordinating Committe for Multilateral Export Controls (CoCom) to the Warsaw Treaty Organization states were stricly limited, this did not apply to India or Pakistan, except as a result of the national export control policy of the US and Canada. The goods sector of export control still excluded dual-use goods (the exception was again CoCom). The system also contained no guidelines for the enforcement of their penalties for breaches of export control laws.

[333] Harald Müller, "Reform of the System of Nuclear Export Controls", in Müller & Dunn, ibid., p. 3

These and the other significant weaknesses of the export control system was particularly because the nature of the proliferation problem had changed as a result of threshold states pursuing a different procurement strategy. They were no longer seeking the supply of complete turnkey plants through overt legal contracts. On the contrary, they now sought to integrate dual-use items and dual-use production equipment into their rudimentary nuclear infrastructures. Hence, the purchasing strategy of the threshold states was concentrated on the weaknesses of the prevailing export control system. It was not until the end of the 1980's that these weaknesses were acknowledged. And, it was the shock of the acute danger of an Iraqi bomb that created pressure to motivate reform of the system.[334] The discovery of the Iraqi clandestine nuclear weapons programme, which was based on imports for ostensibly non-nuclear purposes, prompted the Nuclear Suppliers Group, meeting in Warsaw in April 1992, to adopt the Guidelines for Transfers of Nuclear-Related Dual-Use Equipment, Material and Related Technology.[335]

iv... The Warsaw Guidelines

In 1991, as a result of the US initative, the NSG members met in the Hague for the first time since 1977, and agreed that the existing system had to be supplemented by guidelines on the transfer of dual-use items. The member states decided to appoint a working group to draw up principles and guidelines for export licences, and compiling a list of those dual-use goods to which the guidelines would apply. They also agreed on the principle of full-scope safeguards as a condition of supply; and to meet in Warsaw in the Spring of 1992. In the mean time, in their January 1992 meeting in Switzerland, the member states succeeded in solving the main

334See, Harald Müller,, ibid., pp: 3 - 5.

335Paper by Prof. Jozef Goldblat prepared for a Seminar on Nuclear Non-Proliferation. The author wishes to thank Prof. Goldblat for giving the paper to the author in a private interview at UNIDIR, Geneva in April 1995 at the time of presenting it to the Seminar.

controversial matters which stood in the way to a new system.[336] In their next meeting in Warsaw in March/April 1992, these states adopted four documents namely, the dual-use guidelines; the list; a memorandum of understanding on procedural matters; and a statement on full-scope safeguards.

The *dual-use guidelines* defined non-proliferation objectives as the prevention of transfers of goods which could further 'nuclear explosive activities' or 'nuclear fuel cycle activities which are not subject to safeguards'. The basic principle of guidelines was therefore to prohibit all forms of transfer of listed goods to non-nuclear weapons states. The *list*, on the other hand, included some sixty five goods which could be clasified in eight different categories, such as, uranium separation equipment and components including instruments for laser enrichment and electro-magnetic isotope separation (EMIS); heavy water production equipment extending beyond the goods already specified in the London Guidelines, nuclear weapon test equipment; explosion technology equipment including electronic precision circuits; and other equipment including tritium and tritium plants.[337] With the *memorandum of understanding* the signatories agreed to apply simplified licence procedures in transfers between them, and to conduct a mutual exchange of knowledge and information on the status of nuclear programmes and on the purchasing activities of threshold states. They also agreed to meet each other for consultations at least once a year, and accepted that the Japanese embassy in Vienna acts as the 'point of

[336]The United Stated abandoned its additional demands concerning the scope of the list and the parameters for the machine tools which was in contrast to the position of Japan and France; Japan succeeded in its demands for exporters to refuse export licences for transfers not only to non-nuclear-weapon states but also to nuclear-weapons states if there is an 'unacceptable risk' that the exported goods could be diverted for nuclear explosive activities or used in a way contrary to non-proliferation objectives; and agreement was reached among the states that full-scope safeguards should in future be a condition of supply. This agreement was reached following acceptance of this export condition by France and the United Kingdom 1991. For details see, *Nucleonics Week*, March 14, 1991. Also see, for his comments, Harald Müller, in Müller & Dunn, ibid., p. 7.

[337]The list is noteworthy because it includes for the first time nuclear weapon components and technology for the production of nuclear weapons. In the past, nuclear -weapon states have been reluctant to compile a list of this kind because of concerns about revealing military secrets and their commitments under Article I of the NPT. Müller, ibid., p. 8.

contact', i.e., as the informal secretary to group of signatories. Hence, the export control system has been given a strong institutional structure than was the case with the London Guidelines. Finally, with the *statement on full-scope safeguards,* it was agreed that the goods in the old list of the London Guidelines should not be exported if the recipient country has not accepted the full-scope IAEA safeguards.

a... significance of the Warsaw guidelines

With the improvements in implementation procedures which resulted from the gradual institutionalization of the system, as well as the binding effect of rejection notices, regular consultation and establishment of a point of contact, the Warsaw meeting marked a milestone in the development of the nuclear non-proliferation regime. The meeting extended and stabilized all aspects of the previous export system. It formulated clear criteria for export licence procedures. With the standardization of the full-scope safeguards as a condition for trade in nuclear goods, the guidelines in a way discriminated between the members complying with the non-proliferation regime and those that insist on remaining outside. The agreement on the long list of dual-use items to be subject to licensing procedures is a reaction to the new purchasing strategies of the threshold states which sought to circumvent the prefixed export control system. The inclusion of nuclear weapons technology into the list of controlled goods finally closed a huge gap in that respect which existed in the old system. Furthermore, the supplier states were encouraged to enforce the guidelines and impose penalties for breaching them.[338] Notwitstanding such a remarkable progress in this field, there still exist several points that need to be further improved for a much more effective export control system.

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[338] Ibid., p. 10.

b... weaknesses of the Warsaw guidelines

A principal weakness of the Warsaw Guidelines is that there is no provision about the states which may act as transhipment points in nuclear trade. Those states are neither supplier nor possible proliferators. However, their intermediary role may have a negative impact on the effectiveness of the export control system. Therefore, the guidelines may have a provision to check whether the recipient country has been an intermediary for illegal nuclear transfer in the past. Another issue relate to the enforcement of penalties. Although penalties are envisaged in the guidelines, the procedural matters that are needed to implement them are not specified. This lowers the credibility sanctions. Furthermore, there are no appropriate verifications provisions in the guidelines for controlling the end-uses of the transfered material. Recipients' declarations are considered to suffice -as it is the case for the declaration of nuclear facilities and material as states adhere to the NPT. In addition, the current system of nuclear exports lacks a mechanism for monitoring the implementation of the guidelines by the signatories. Finally, as noted by Harald Müller, not all the supplier states view steps towards further institutionalization with great sympathy. In that respect, the Japanese proposal to convert the Suppliers Group into a more permanent organization with semi-annual meetings, a decision-making structure and a more formal administration, was rejected.[339] It would be wise to establish some sort of institutional link to other activities taking place in the field of export control so as to increase overall effectiveness of the system.

v... Suggestions for an Enhanced Export Control System

The success of the reform in the export control system will unquestionably depend on the attitudes of its drafters. Willingness of the signatories to seriously implement the guidelines and to cooperate with each other will certainly help

[339] Japanese proposal was forwarded during the first meeting at the 'point of contact' in Vienna, in December 1992. See Harald Müller, ibid., p. 13.

forging the reforms. As regards the success of the new export control system, the situation within the frontiers of the former Soviet republics should be seriously considered. To this end, the experience gained by the older members of the 'Club' should be transmitted to the 'newcomers' out of the former Soviet Union. The porous frontiers of these newly independent republics are very convenient for illegal trafficking of especially fissile material.[340] With the partial exception of Russia, none of these republics have the necessary laws, regulations, procedures, mechanisms, and trained personnel to ensure effective control over exports from its territories. Hence, leaky export control procedures of these states need to be overhauled.[341] There is also great concern about the threat of a "brain drain" (intellectual export) of skilled and experienced nuclear scientists andengineers who could assist rogue regimes with clandestine nuclear programmes. The US and Europe have provided funds for International Centers for Science and Technology in Moscow and Kiev in order to provide contracts for the civil employment of nuclear experts, but there is concern that these efforts are not subtantial enough to address the problem fully.[342]

C... Comprehensive Nuclear Test Ban

Nuclear disarmament, as it is envisaged today, should not be confined to disarmament of the five *de jure* nuclear-weapons states, but should also encompass states that have already become *de facto* weapons states, and those that may choose nuclear path in the future. An effective way of realizing a comprehensive

[340]During 1994, there was an unprecedented increase in cases of nuclear smuggling and this seems to be continuing unabated. Although the sources of the smuggled material do not seem to be weapons facilities, some cases have involved genuinly significant material. Moreover, concern about nuclear smuggling has been fuelled by recent reports about the possibility of building nuclear weapons with smaller quantities of fissile material than was hitherto believed. Another alarming possibility is the use by terrorists of so-called radiological weapons which would employ material such as radioactive waste scattered by a conventional explosive. North Atlantic Assembly (NATO Parlamentarians), Draft Information Document, *Nuclear Proliferation*, Scientific and Technical Committee, AM 310 STC (95) 10, October 1995, p. 14.

[341]For a comprehensive set of proposals in this regard, and for more about universal concern with controlled nuclear exports, see Lewis A. Dunn, "Buttressing Nuclear Export Controls and Supply-Side Restraints: Initiatives and Actions", Harald Müller & Lewis Dunn, ibid., pp: 20 - 25.

[342]See the NATO document, p. 14.

disarmament would therefore be to put an end to testing nuclear explosives and their related components. Because, it will not be possible for at least the aspiring states to count on the credibility of their nuclear explosive devices, if they may develop at all, without testing (except the Hiroshima-type primitive nuclear explosives). Hence, the will of such states to hold a stockpile of powerful nuclear explosives would probably diminish.[343] Seen from this perspective, the contribution of achieving an all-encompassing nuclear test ban to strengthening the non-proliferation norm, will be straightforward.

i... The Historical Context

Achieving a Comprehensive Test Ban Treaty (CTBT) is one of the oldest items on the international nuclear disarmament and arms limitation agenda. In mid-1950s it was regarded as a measure which would both halt the race then taking place to develop more powerful atomic and thermonuclear weapons, and stop pollution of the atmosphere with radioactive fall-out resulting from atmospheric testing. The negotiations on a CTBT in the late 1950s and early 1960s took place in the context of a Soviet Union - United States - United Kingdom moratorium on nuclear testing, from 1958 to 1961, and a disarmament agenda which involved talks to stop the production of fissile material and nuclear warheads in the three existing nuclear-weapons states, and for them to engage in nuclear disarmament. None of these negotiations resulted in a satisfactory agreement, though in 1963 the Soviet Union, the United Kingdom and the United States signed a Partial Test Ban Treaty (PTBT) in Moscow. The PTBT limited nuclear testing to underground locations. By the mid-1960s, attempts to negotiate an East-West agrement on both conventional and nuclear disarmament had given way to the idea of negotiating arms control and disarmament measures in successive stages, starting with a nuclear non-

[343]The author wishes to thank Mr. Asım Arar from the Turkish Ministry of Foreign Affairs for supplying his article on the nuclear test ban issue, *Nükleer Yayılmanın Önlenmesi, Nükleer Denemeler ve Kapsamlı Nükleer Deneme Yasağı*, unpublished article, Ankara, February 1996.

dissemination/proliferation agreement, namely the NPT. Specitfic references were made in the Preamble to the Treaty to the discontinuance of all test explosions, the cessation of the manufacture of nuclear weapons and the elimination of all stockpiles. Article VI of the NPT also contained an undertaking 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 on a treaty on general and complete disarmament.*[344]

Negotiations on a CTBT between the Soviet Union, the Unite Kingdom and the United States restarted in 1977, but were suspended at the end of 1980. The issue of CTBT had been on the agenda of the Conference on Disarmament (CD) in Geneva, but no actual negotiations took place, owing to the opposition from the United Kingdom and the United States.[345] In January 1991, a conference was held at the United Nations in New York to attempt to amend the PTBT into a CTBT, but it broke up without achieving any obvious progress towards this goal. Following the entry into force of the NPT in 1970, in the Treaty Review Conferences that followed every five years, the lack of visible progress towards a CTBT was seen as a key indicator that the nuclear weapons states were not fulfilling their obligations under Article VI. The inability to reach agreement over wording relating to this issue resulted in the failure to agree a final document at the NPT Review Conferences of 1980 and 1990.[346]

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[344]Darryl Howlett & John Simpson, *The NPT and the CTBT: an Inextricable Relationship ?*, Programme for Promoting Nuclear Non-Proliferation, Southampton, UK, Issue Review, No:1, March 1992, p. 1

[345]CTBT has been viewed detrimental to the security interests of the United Kingdom and United States because of their perceived absolute needs to maintain nuclear deterrence and the technical credibility of their nuclear stockpiles. Hence, any non-proliferation benefits a CTBT might produce were viewed as having a lesser priority.

[346]Ibid., pp: 1 -2.

ii... Earlier Thoughts on Nuclear Test Ban

Soon after the first nuclear explosion in 16 July 1945 at Alamogordo Desert, Los Alamos, New Mexico, the diverse effects of nuclear weapons had brought about the necessity, at least at the intellectual level, to put a limit, or rather a complete ban to nuclear tests. At the beginnig, such a ban was pursued, as Howlett and Simpson put it, for at least four specific purposes:

...to prevent developments in nuclear weapons technology moving out of control towards a potential catastrophe;

...to stop the harmful environmental consequences of atmospheric testing;

...to deny to existing nuclear-weapons states the ability to develop and deploy thermonuclear weapons; and

...to put pressure on aspiring nuclear weapons states to refrain from testing any types of nuclear weapons.

In the intervening years, some of the original objectives of the CTBT have taken on a different significance:

...the PTBT resolved the environmental problems by prohibiting atmospheric testing;

...all of the declared nuclear-weapons states have tested their thermo-nuclear devices; and,

...with the current level of nuclear technology, states have become able to design and construct as well as to stockpile Hiroshima-type fission weapons without nuclear explosive testing; and most significantly,

...the drastic changes have taken place in the intenational system.

iii... Debate Over the Consequences of a Comprehensive Test Ban

To assess the impact of a comprehensive ban on further well-being of the nuclear non-proliferation regime, it may be useful to elaborate on the points of contact between the two issues. For doing this, it would be wise to go through the debate among the scholars, scientists, and policy makers as to what would be the consequences of an all-out ban on nuclear testing on both the nuclear-weapons states and the non-nuclear-weapons states. The positions of the parties to the debate (those in favour of cessation, and those in favour of continuation of nuclear tests) may then provide hints in these respects.

Many of those who believe that nuclear deterrence has kept peace during the Cold War years are mostly in favour of continuation of nuclear explosive testing by putting forward that the safety and the credibility of their nuclear force posture necessitate such tests. Those who favor cessation, however, argue that a CTBT could provide a major contribution to the enhancement of international security at a minimal cost to the deterrent postures of the existing nuclear weapons states. As Howlett and Simpson note, this is because important considerations in support of continued testing, such as safety, reliability, weapon modernization and maintaining relevant personnel, can be accomplished in other ways.

Those who argue that nuclear tests are utmost important, if not definitely imperative, hold that the test are mainly required for: tailoring nuclear warheads to specific delivery systems; evaluating the effects of nuclear explosions on the functioning of both nuclear and conventional weapons; ensuring safety and security of the stockpile; garding against technological surprises; guaranteeing the technical reliability of existing warheads; and maintaining a cadre of personnel with relevant technological knowledge who would have the confidence to make judgements about the effects of changing the components in existing nuclear weapons.[347]

[347] For an excellent assessment of the cited issues see, Howlett & Simpson, ibid., pp: 2 - 4.

Moreover, of those scholars who favour the continuance of nuclear tests holding that such tests are crucial for the continuance of the nuclear deterrence capability of the *de jure* nuclear-weapons states, Katheeen Bailey points out to the fact that such states as North Korea, Iran, Syria, and Libya show evidence of being interested in acquiring nuclear weapons. And that, India, Israel and even Pakistan have already developed nuclear weapons. Hence, in such a circumstance, the United States and Russia are likely to need to deter nuclear forces other than each other's. Since, as the nuclear arsenals of both will diminish and the number of warhead designs deployed will be reduced, there will be increased need to be sure that the systems work, and without testing a large proportion of the current stockpile in either country will be rendered ineffective if just one device design were to be faulty. Accordingly, Bailey concludes that it would be *both ironic and foolhardy for either the United States or Russia to give up nuclear testing at a time when the number of states they may have to target and deter is growing.*[348] Bailey further suggests that *neither the United States nor Russia should stop all nuclear testing until all potential proliferants and existing nuclear-weapons states agree to adhere to a ban.* The underlying reason in this line of thought is that, according to its proponents, there is no relationship between banning nuclear tests and enhancing nuclear non-proliferation, because:

...Testing by declared nuclear weapons states is not a driving force behind proliferation;

...Proliferant nations do not need to test in order to acquire a first-generation nuclear weapon capability, as Pakistan and others have proven;

...The NPT does not call for a CTBT but only mentions in the preamble. It states that the preamble of yet another treaty (the 1963 Limited Test Ban Treaty) calls for discontinuance of all nuclear explosives testing;

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[348]Kathleen C. Bailey, *Strengthening Nuclear Non-Proliferation*, Westview Press, Boulder, 1993, p. 64.

...A ban does not constitute disarmament. It does not get rid of any weapons, nor does it place any limits on further weapons production.[349]

Hence, based on what is quoted above, one might argue that, if a comprehensive ban on tests will not contribute to the cause of nuclear non-proliferation, what would be the feasibility of risking the deterrence potentials of existing nuclear powers whose mere existence are believed to have kept the long peace between the East-West blocks for decades. Notwithstanding such a line of reasoning, one should bear in mind that achieving a comprehensive nuclear test ban will have at least a psychological effect on the non-NPT non-nuclear weapons states. And, this effect may ultimately direct the hold-out states towards joining the non-proliferation regime by any means.[350] Hence, if safety, reliability and survivability of the existing nuclear deterrent can be achieved by alternative methods rather than explosive testing, achieving an all out test ban would therefore prove feasible.

iv... Alternative Methods for Ensuring Safety & Reliability of Weapons

The argument that *new delivery systems* or revised force postures have been driving force behind requirements for new warhead designs should no more be imperative due to the recent developments in the delivery systems which are build around the existing warheads. And, alternatively modifications can be made to the dimensions, weight, and yield of warheads in the existing inventory without explosive testing while retaining confidence in their predicted yield.

Nuclear tests were also conducted for evaluating the *effects of nuclear explosions on the functioning of both nuclear and conventional components*. The degree of survivability of various delivery vehicles, warheads and military system when

[349] Bailey, ibid., p. 61.
[350] These 'any means' are either the NPT itself, or the NWFZs or bilateral/multilateral nuclear restraint agreements. which are elaborated in sufficient detail in Part II and Part III.

subjected to nuclear explosions of different types and yields needed to be tested. Whether the knowledge about the nuclear weapons effects accumulated thus far would suffice for evaluating the functioning of military systems without exposing them to nuclear tests remains to be investigated fully. However, many individual types of weapons effects can be generated in test-rigs using sources other than nuclear explosion.[351]

Nuclear tests have been used to evaluate the likelihood of *innovations in nuclear explosive technology,* in order to reduce possibilities that such innovations, if made by a potential adversary, would have a negative effect on the state's own security position. But, since nuclear explosive technology has been developed for five decades, the likelihood of innovations to stimulate a major change in the force postures of states is considerably low. Thus, the need to conduct nuclear explosive tests to fulfill this need should also be lower.

To ensure the *safety and security of the nuclear stockpile* has also been a mjaor concern of weapons designers. Ensuring that no nuclear yield occurs in case a nuclear warhead is exposed to an abnormal condition such as fire, required a variety of safety standards, and thus nuclear explosive testing. Today, weapons designs which minimize the risk of accidental detonation of the chemical explosives in the warheads (which trigger the nuclear explosion) are available. Moreover, the risks of unauthorized use of nuclear weapons can be reduced by improvements to existing designs and processes rather than by the production of new designs requiring revalidation by explosive testing.[352]

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[351]Similarly, satellite components can be exposed to the radiation produced by nuclear explosions in space by using materials testing reactors or particle accelerators. Chemical explosions can simulate most blast effects. Howlett & Simpson, ibid., pp: 2 - 3.

[352]Improvements may involve enhancing the existing software controlling launch and detonation processes, and introducing more sophisticated and secure coded destruction systems in the event of unauthorized use. See, Howlett & Simpson, ibid., p. 4.

Ensuring that stockpiled *nuclear warheads remain reliable* over periods of ten to thirty years requires a systematic programme of periodic warhead disassembly and checking of individual components, to ensure that process of ageing have not changed them. If processes of ageing are identified, and they create uncertainties over whether the weapon will operate as designed, this may require remanufacturing of either some of its components or the entire weapon. Computer simulations of the impact of changes generated by remanufacturing upon the functioning of weapon, using data acquired from past nuclear explosive testing, have been developed and can resolve many uncertainties.[353]

Maintaning a cadre of *personnel with relevant technical knowledge* has also been considered as an imperative for the continuance of nuclear explosive testing so as to guarantee the safety and reliability of warheads, as well as the effectiveness of any design improvements to them. These personnel are believed to have ongoing practical experience of design problems and knowledge of how to move from the design stage to a workable weapon. It is further argued that, if safer, more secure and reliable nuclear weapons are to be produced and stockpiled, it is necessary that a technical culture of nuclear weapons experts is maintained. However, this argument is being challenged by the fact that, explosive testing is only a limited part of an overall nuclear weapon research programme, and the assertion that removal of the testing element will unduly affect expertise or morale is highly disputable, especially

[353]It continues to be argued that nuclear explosive testing may still be required in some cases, both to ascertain the effects of ageing and the ability of remanufactured weapons to operate in conformity with the original design specifications. As noted by Howlett & Simpson, the Kidder Report of 1987, in USA, indicated that warheads which have been thoroughly tested prior to deployment can be expected to remain reliable. But, where warheads have been inadequately tested prior to introduction, confidence in their future reliability may be reduced and corrective action, including nuclear testing, may prove necessary. But fortunately, few, if any, current warheads fall into this latter category. See, R. E. Kidder, *Stockpile Reliability and Nuclear Test Bans. Response to J. W. Rosengren's Defense of His 1983 Report*, Livermore, California, Lawrence Livermore National Laboratory, February 1987, cited in Howlett & Simpson, p. 5.

if new simulation methods were to be developed as surrogates for nuclear explosive testing.[354]

v... The Impact of a Test Ban on the Non-Proliferation Objective

Part of the discussion so far revealed that no consensus has been reached among the scholarly and scientific circles yet on whether to put a halt to nuclear explosive tests or not. The lack of consensus emanates mainly from a disagreement on the primary objective of the NPT. If NPT is said to primarily aim at preventing the horizontal spread of nuclear weapons, a CTBT would not contribute to this aim so far as the states may be happy with primitive low-yield Hiroshima-type fission weapons which do not necessitate actual explosive testing. Because, laboratory exprementation or the published documentation about the fission bombs offer a potential proliferator the necessary information to construct a gun-assembled or implosion device.[355]

However, if the NPT is also said to aim at, if not primarily, facilitating nuclear disarmament and preventing further modernization and sophistication of existing nuclear arsenals, then achieving a CTBT would certainly contribute to the non-proliferation cause. Since, advanced nuclear weapons will surely necessitate explosive testing, then a ban to nuclear test would be a major impediment in that respect. Bearing this technical side in mind, it should further be noted that, the conclusion of a CTBT is still seen by many NPT parties as part of the political bargain inherent in the Treaty i.e., by accepting a non-nuclear-weapon state status these states have expected parallel limitations to be accepted by the nuclear-weapons states. This bargaining chip has had an impact on the NPT Review Conferences in 1980 and 1990 by not giving way to producing final declarations. Since, non-nuclear-

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[354]Howlett & Simpson, ibid., pp: 4 - 5.
[355]For a detailed explanation about nuclear explosives, see the Appendices.

weapons states feel that they are threatened by all nuclear weapons, not just those of *de facto* or would-be nuclear-weapons states. That fear may significantly be responsible for additional non-nuclear-weapons states to choose nuclear path in their security considerations. When seen from this perspective, which is in perfect conformity with the main theme of this thesis, those arguments stating that a comprehensive ban on nuclear test would have nothing to do with cause of nuclear non-proliferation, become unwarranted.

vi... The Current Situation in the CTBT Issue

The former Soviet Union was the first to halt nuclear testing when, in October 1991 then-President Mikhail Gorbachev announced a one-year moratorium. In 1992, George Bush signed a bill halting American tests for nine months which, in turn, prompted Boris Yeltsin to extend the moratorium until July 1993. Subsequently, the American moratorium was extended again for a minimum of fifteen months, provided the other nations did not conclude tests during that period. In January 1995, President Bill Clinton announced an indefinite extension of the American ban on nuclear testing. The American ban also prevented British nuclear weapons tests since the United Kingdom uses American test sites in Nevada. In any event, the United Kingdom declared a formal end to nuclear testing in April 1995. In April 1992, French President François Mitterand proclaimed a moratorium until the end of that year, and in early 1993 he stated that France would forgo additional testing as long as the United States and Russia refrained. However, this moratorium was opposed by elements of the French military who argued that further testing was needed to maintain and enhance France's nuclear deterrent and to develop the simulation technology needed to enable France to forgo testing in the future.[356]

[356]See the Draft Information Document, North Atlantic Assembly (NATO Parlamentarians), *Nuclear Proliferation*, Scientific and Technical Committee, AM 310 STC (95) 10, October 1995, p. 11.

Negotiations on a CTBT have been in progress in the Conference on Disarmament (CD) in Geneva since August 1992, and following the NPT extension decision in May 1995, there was considerable optimism about the succesful conclusion of these negotiations in 1996. However, in just hours after the NPT extension decision, P. R. China conducted a nuclear test. Moreover, the French President Jacques Chirac announced that France too would conduct a series of up to eight nuclear tests by May 1996. The reason cited for French nuclear tests is the need to develop the simulation technologies required to modernize nuclear arsenals without conducting further tests. The French leadership declared that the current tests (resumed in the sixth) will mark the definitive end of its test programme. It has been declared that France will support a complete test ban. On the other hand, China conducted another test in August 1995. Though China is believed to conduct further tests in 1996, Chinese authorities declared that China would comply with a complete test ban in 1996. Despite French and Chinese nuclear testing, progress toward a complete test ban is being made. The announcements by France and the United States that they would support a complete test ban -so that even nuclear explosives with exceptionally low yields would be prohibited- have helped move negotiations forward.[357]

D... Cut-Off Production Fissile Materials

Stringent limits to the availability of fissile materials -plutonium and highly enriched uranium HEU as the most essential element of the process of manufacturing nuclear explosive devices- would certainly make it much harder, if not totally impossible, acquiring brand-new nuclear weapons capability clandestinely by the aspiring states. In this regard, a universal convention which would require

[357]Although some issues have been resolved, disagreement persists over entry into force provisions; the nature of implementation agency for the test ban; and aspects of verification such as the number of monitoring stations, on-site inspection procedures, and the role of national technical means of verification. Ibid., pp: 12 - 13.

halting the production of fissile material for nuclear weapons is an issue which is being seriously considered in international circles. But achieving such a convention does not appear to be a straightforward one due to its likely repercussions for both the nuclear-weapons states and the non-nuclear-weapons states party to the NPT, as well as the so-called *threshold* states which are believed to have already manufactured nuclear explosives.

i... Political Aspects of a Cut-Off Convention

The idea of putting an end to the production of fissile material was first and then repeatedly voiced by the United States in the early 1950s at a time when the concern was to try to halt the Soviet production. But the Soviets rejected the US suggestions for they were still trying to catch up with the US level of nuclear armament. In the 1980s, this time it was the United States which would reject the Soviet suggestions to put a halt to the fissile material production. But, at present, since START-II imposes deep cuts it the number of warheads to be held in the nuclear arsenals of both the USA and Russia, then the idea of a cut-off seems more plausible. Hence, on 26 Semptember 1993, the Clinton administration put forward a major non-proliferation initiative by announcing that the new US administration would give priority to the cut-off issue with a renewed momentum.[358] And, the 1993 session of the United Nations General Assembly witnessed a consensus on that subject which indeed had been in the multilateral disarmament agenda (i.e., Conference on Disarmament in Geneva) for decades. Accordingly, on 16 December 1993, the UN General Assembly adopted without a vote the Resolution on Prohibiton of the Production of Fissile Material for Nuclear Weapons or Other Nuclear Explosive Devices.[359] The General Assembly Resolution set out the

[358]The US President Clinton called for a Multilateral Convention Prohibiting the Production of Highly Enriched Uranium or Plutonium for Nuclear Explosive Purposes or Outside of International Safeguards.

[359]United Nations General Assembly, 48th Session, Resolution 48/75L.

parameters of an agreement on cut-off. Accordingly, the Resolution called, first of all, for multilateral negotiations on the modalities of a universal convention. Secondly, it defined the scope by calling for the banning of production of fissile material for nuclear weapons or other nuclear explosive devices. Thirdly, the Resolution permitted the production for legitimate civilian uses and non-explosive military purposes such as naval propulsion. And, finally, it recommended a non-discriminatory verification regime to provide requisite confidence in a cut-off treaty. In is interesting to note at this stage that the current stockpiles of fissile materials, either at the disposal of *de jure* nuclear-weapons states or in the hold-out (threshold) states suh as India, Pakistan and Israel that are not subject to the full-scope IAEA safeguards, will not be subject to verification. Whereas, these stockpiles will be capped as of the entry into force of a cut-off treaty.

The concept of a cut-off has traditionally been seen as part of a larger package of disarmament measures which also included a comprehensive test ban that can prevent the development of new weapons as well as a ban on further production of such weapons. Whether or not a cut-off is seen as a disarmament initiative on its own merits or as part of a package, it is nonetheless part of an incremental process, reinforicing the trend of moving towards a nuclear-weapons-free culture.[360] If a universal cut-off agreement can be achieved, the IAEA controls on installations of the states like India, Pakistan, and Israel producing highly enriched uranium and plutonium can be presented as an appreciable advance. Since, nothing concrete had come of all the attempts made to induce such states to accede to the non-proliferation regime. It is accordingly asserted that, the United States presented its

[360]See Rakesh Sood, "Halting Fissile Material Production for Weapons: A Step Towards Nuclear Disarmament", in Thérèse Delpech, Lewis A. Dunn, David Fischer and Rakesh Sood, *Halting the Production of Fissile Materials for Nuclear Weapons*, UNIDIR Research Paper, No: 31, New York & Geneva, pp: 47 - 58.

proposed convention as a non-proliferation measure chiefly in regard to those three countries.[361]

a... stance of the nuclear-weapons states

The United States and Russia, which possess considerable stocks of fissile materials are all the more inclined to support the proposed convention in that it does not entail any special constraints and enables them, on the contrary, to announce as a measure in the direction of nuclear disarmament a decision that would have to be taken in any case. However. France and the United Kingdom are in a different position. They have a more modest arsenal and much smaller quantitites of fissile material. They must therefore see the preservation of their basic interests in the convention. In addition, both countries have a powerful nuclear industry, particularly in the nuclear fuel cycle field, and nuclear powered submarines. Therefore, they are lukewarm about an extension of international controls within their territories. Despite all these factors, the two nuclear-weapon states have adopted a favourable position of principle regarding their participation in the negotiations, provided at least that the benefit in terms of non-proliferation is clear. As to the position of China, it is one of more conservative and reluctant when compared to the other nuclear powers. China considers that there is no possible comparison between its stocks and those of the United States and Russia, and that it is not in its interest to take an active part in negotiations that would place it at a very considerable disadvantage.[362]

[361]Thérèse Delpech, "A Convention on the Prohibition of Fissile Material: Uncertain Benefits for Non-Proliferation", in Thérèse Delpech *et al*, UNIDIR Research Paper, No: 31, p. 3.

[362]See Thérèse Delpech, ibid., pp: 5 - 6. For estimated amounts of plutonium and highly enriched uraniumin military stocks of the five nuclear-weapons states see, David Albright, Franz Berkhout and William Walker, *World Inventory of Plutonium and Highly Enriched Uranium*, Oxford, Oxford University Press for SIPRI, 1993, pp: 198 - 200. Accordingly, by the end of 1990, Commonwealth of Independent States (CIS) had 125 tonnes of plutonium (PU-239) and 720 tonnes of HEU; the United States had 112 tonnes Pu and 550 tonnes HEU; the United Kingdom had 11 tonnes Pu and 10 tonnes HEU; France had 6 tonnes Pu and 15 tonnes HEU; Finally, China had 2.5 tonnes Pu and 15 tonnes HEU. Assuming that, on the average, approximately 4 kg of plutonium or 15 kg of HEU are needed per nuclear warhead, then for instance the French stocks of fissile material would suffice 1000 to 1500 warheads, and China's

b... stance of the threshold states

Of the three threshold states, Israel's nuclear capability is likely to be least affected by a cut-off. By all accounts Israel has the largest and the most sophisticated nuclear arsenal, and the most effective means of delivery.[363] Israel's inventory of weapon-grade plutonium is similar to that of India, in terms of nuclear explosive potential, much larger than that of Pakistan. Hence, Israel, unlike the other two threshold states, has at present no real or potential nuclear armed adversary.[364] On the other hand, a cut-off would leave India with rather ample stocks of fissile material, but if the cut-off were combined with CTBT, India would be left with few nuclear warheads. For the forseeable future India would be condemned to remain greatly inferior to China.[365] Finally, Pakistan has little hope of catching up with India in nuclear industry and sophistication.[366] Therefore, it refuses any approach that could lead it to sign the NPT unless India undertakes to do likewise. Pakistan, however, could also have come to the conclusion that it would be advantageous for it today to halt production in both countries as soon as possible, given the fact that the disproportion between the fissile material stocks of India and Pakistan may be much more increasing in the future.[367] Having said these about the stances of the

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stocks would manufacture 600 warheads, whereas the British stock would suffice for some 700 warheads.

[363]See, T*he Military Balance 1993-1994*, London, Brasseys for International Institute for Strategic Studies (IISS), p. 118.

[364]If Iran's recent engagements with Russia and China to build two 1300 MW light-water reactors in Bushehr and their likely implications to the security considerations of Israel are to be neglecled for the time being.

[365]With regard to halting both horizontal and vertical proliferation of nuclear weapons, India presented a resolution, in 1982, to the UN General Assembly, concerning A Freeze on Nuclear Weapons (UNGA, 37th Session, Resolution 37/100A) accompanied by a cut-off in production of fissionable material for weapons purposes. And, the Indian resolution which was tabled annually was merged in 1988 with a Mexican resolution on the same subject which also included a comprehensive test ban on nuclear weapons and on their delivery vehicles. Canada too had a resolution on the same subject. However, the then stance of the nuclear-weapons states made forward movement on the subject impossible. These developments imply that the official stance of India, which is indeed seen as one of the most problematic countries in these issues, will be affirmative as regards to the putting into force a cut-off treaty.

[366]David Fischer, "Some Aspects of a Cut-Off Convention", in David Fischer *et al*, ibid., UNIDIR Research Report, No: 31, pp: 28 - 31.

[367]Estimates of the total quantities of plutonium at the disposal of Israel amount to 275 - 475 kg by the end of 1995. With this amount of separated plutonium Israel is able to produce 55 - 95 nuclear warheads. The corresponding figures for India are 290 - 425 kg plutonium enough for

threshold states vis-à-vis a would-be cut-off convention, it seems that, so far as the reactions of the fissile material producer states are concerned, achieving a universal convention is not a remote possibility.

c... non-nuclear states' concerns with legitimation of the thresholds

The fact that capping production of fissile material will be effective as of the date of the entry into force of a universal cut-off convention (or a treaty), the fissile material produced by a state party to the convention will not be subject to any constraint. In other words, the fissile material hitherto produced by the non-NPT threshold states will be freely used for either civilian or military purposes (until these stase do accede to the NPT as non-nuclear-weapons states and fully respect the non-proliferation norm). The concern of the non-nuclear-weapons states party to the NPT is therefore the oblique legitimation of the nuclear-weapon state status of the threshold states by a treaty. Those states which are capable of producing fissile material but have previously joined the NPT will therefore be in a disadvantageous position when compared to the current hold-out states having stockpiles of considerable amounts of weapons-grade nuclear materials.

When a convention will be signed it will certainly require verification of the basic undertakings of states party to it. But, the possibilities of measures to be taken against a state will be limited if the verifying body finds out initially undeclared material in the inspected facilities of the states. Because, inspected states may then assert that the fissile materials in mention was produced before the cut-off, and that it was under no obligation to declare it. Therefore, if the convention implicitly recognizes the right of the threshold states to be regarded as nuclear-weapons states (legitimize), then nuclear exports to such countries should be subject to the same

85 warheads. Neither Israel nor India are known to have significant amounts of HEU at stock. As for Pakistan, that state is estimated to have had enough HEU in stock (a figure like 130 - 220 kg) which would enable Pakistan to produce some 10 warheads. See, Albright *et al.*, pp: 155 - 166.

regime as that applying to exports of the five *de jure* nuclear-weapons states under Article III.2 of the NPT.[368]

ii... Technical Aspects of a Cut-Off Convention

Effectiveness and thus relevance of a cut-off treaty with regard to the efforts spent to strengthen the nuclear non-proliferation regime will heavily depend on the verification provisions that will be stated in the treaty articles. There are concerns amongst the scholars, scientist, and policy makers as to which body would be responsible for carrying out such a burdensome process. And, the IAEA appears to be the best candidate for the time being, provided that its budget is at least doubled, or even tripled. This being said, the major problems in this respect are, first of all, whether a cut-off can be effectively verified by the organization that will be given this task; and, secondly, what overall verification approach should guide the verification provisions: a comprehensive IAEA-like approach, or one with a more streamlined nuclear facility targeted approach ? Such and other questions will find their answers during the multilateral discussions on the modalities of a cut-off convention.[369] However, the concern of this study with the cited problems is to investigate whether the verification provisions of a cut-off will have a positive impact on the verification culture of the non-proliferation regime; and whether the current threshold states will be subject to comprehensive verifications of the IAEA in a foreseeable future.

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[368] NPT does not require any safeguards on nuclear exports of the five nuclear-weapons states.

[369] A Group of Technical Experts, comparable to the Group of Scientific Experts established within the Conference on Disarmament to take on the CTBT issue, can be established to elaborate on the Cut-Off issue as well. The works of such a Group may also facilitate the inclusion of the threshold states into to the cut-off convention by paying special attention to their peculiar security considerations.

iii... Cut-Off and Nuclear Non-Proliferation

A brief analysis of the fissile material cut-off issue revealed that a universal convention to cap further production, when considered within itself, should not imply high expectations in the name of strengthening the nuclear non-proliferation regime. Because, the already existing fissile materials at the disposals of non-NPT states, so far as they are not joined the NPT, will still suffice to endanger the international peace and security. However, a successfully drafted cut-off convention may attract the threshold states at first to join the convention and accept relatively more comprehensive IAEA verification when compared to the current IAEA job in these countries. And, then, at a second stage, these countries may be better persuaded to join either regional nuclear restraint agreements or adhere to the universal Non-Proliferation Treaty. Moreover, a cut-off is high on the list of the arms control measures sought by the non-nuclear-weapons states. The conclusion of such a treaty would help substantitate the nuclear-weapons states' contention that they are carrying out their obligations under Article VI of the NPT. And, since a cut-off treaty would apply to both the nuclear haves and the have-nots alike, and should bring the entire civilian nuclear programmes of the nuclear-weapons states under IAEA safeguards, it would, in this sense, diminish the discriminatory aspects of the non-proliferation regime. On both counts, it would improve the prospects for a strengthened non-proliferation regime.[370]

E... Significance of Intelligence

Availability of accurate and reliable information about the activities of states in the field of nuclear energy is of utmost importance for the proper functioning of the nuclear non-proliferation regime with all its aspects. Information constitutes the basis of all kinds of evaluations about the performance of the states and the regime itself. Short of reliable and sufficient information, no convincing verification can be

[370]See David Fischer, ibid., p. 27.

fully implemented especially in the suspected states. No matter how stringent measures be adopted, unless the IAEA is supplied and makes use of accurate and timely information about the states, the outcome of inspections may not fully assure the international community about the healthy functioning of the non-proliferation regime. Because of its significance, this issue has been, from time to time, brought into the discussion tables at different levels in international gatherings. But, no substantial results have been obtained.

i... Problems with Supplying and Using Information

There are various causes for not making use of supplementary information about the activities of states. Part of these relate to the scarcity of national tehnical means all over the world. Such sophisticated technical means as satellites, remote sensors and the like are available only to small group of states. Another reason was the reluctance of the IAEA Board of Governors in counting on the information supplied to it -either directly communicated to the Agency, or the information that appeared in the media. Strong trust of the Board members to the accounting system that the Agency inspectors implemented during their routine inspections, undermined the significance of information made available to the Agency from elsewhere. The issue of using extraneous information has also been thought, by some of the influencial Board member states' representatitves (e.g., India) to be humiliating for the IAEA. Those holding a similar line of reasoning within the Agency circles further asserted that intelligence gathered through the technical means of such states as the United States might have been biased, and therefore untrustworthy. This has been the picture of the 1980s. But with the beginning of the 1990s, the attitude of the IAEA authorities are changing though the pace is slow and difficulties remain.

In the immediate aftermath of the discoveries of the clandestine nuclear weapons programme of Iraq, there was an upsurge of enthusiasm for making national intelligence data available to the IAEA so that it could improve its inspections. In February 1992, along with the Board's approval reaffirming the right of the IAEA to undertake special inspections, the Board "further reaffirmed the Agency's right to obtain and to have access to additional information and locations in accordance with the Agency's Statute and all comprehensive safeguards agreements."[371] While this language has been taken from INFCIRC/153 and therefore could not be labeled as a new power or authority for the Agency, the interpretation of this wording was new. Accordingly, the Director General of the IAEA stated his intention to invite all member states to provide him with relevant information and he is further believed to be in favour of setting up an intelligence unit of the Agency in order to receive and evaluate the data.[372] Some countries were upset with the idea that the Director General would solicit information from third parties. The Belgian representative to the Board of Governors noted there was a danger that the Agency might act upon doubtful, arbitrary, or biased information, and that the state against which information was directed might not have any opportunity to refute it or to justify itself. Others feared that the dominant source information would be the United States, turning the IAEA into a tool of Washington.

Although it has created too much anxiety in some circles, for a variety of reasons, Director General's proposal to establish an intelligence unit not likely to lead to a substantial long-term increase in the flow of high-grade national intelligence information to the IAEA unless an appropriate restructuring can be achieved.

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371 IAEA Board of Governors, "Record of Seven Hundred and Seventy-Sixth Meeting", GOV/OR.776, April 9, 1992, p. 16.

372 This was a departure from the generally accepted past understanding that information regarding a country's nuclear activities would come only from the country in question, from IAEA activities in that country, or from data provided by a supplying country. See Kathleen Bailey, ibid., p. 71.

Because, national intelligence communities may remain reluctant to provide, on a continuing basis, information to an international bureaucracy that does not even perform background checks on its own staff before or after hiring. It also seems difficult to expect national intelligence agencies to count much on the IAEA as an organization which has no real communications security, nor document storage that measures up to national secure storage standards. Furthermore, the IAEA is claimed to lack any counter-intelligence culture and capability.[373]

ii... Technical Means Available for Intelligence Gathering

Various means exist to gather intelligence on nuclear weapons programmes such as, NUCINT for nuclear intelligence, IMINT for imagery intelligence, COMINT for communications intelligence, and HUMINT for human intelligence. The most direct technical means of collecting intelligence on other nations' nuclear weapons programmes is through variety of sensors that fall in the NUCINT category. Such sensors which detect radiation and other effects resulting from radioactive sources, can be deployed on spacecraft, aircraft, ships, helicopters etc.. Fuel reprocessing plants can be monitored by the releases of krypton-85 gases, which are sufficiently large to be detectable at long distances. Similarly, plutonium production reactors can be detected by satellite infrared sensors. However, NUCINT sensors become much less valuable when the questions involve a nation's nuclear intensions, its efforts to acquire nuclear material and technology, research and development, or production work. None of such efforts give off signals detectable by technical sensors. In spite of the massive intelligence-gathering means at the disposition of several nations, including overhead reconnaissance and electronic intercepts, there may be serious deficiencies in the general assessment of a nation's nuclear programme, due to an inadequate devotion to human intelligence collection and an overreliance on

[373]See the criticisms and suggestions of David Kay in these matters. David Kay, "The IAEA: How Can It be Strengthened ?", in Mitchell Reiss & Robert S. Litwak (eds.), *Nuclear Proliferation after the Cold War*, The Woodrow Wilson International Center for Scholars, Washington, 1994, p. 326.

technical collection. Therefore, HUMINT can be potentially applied to suspected states' nuclear programmes in order to provide a level of understanding that would probably be unavailable from technical collection. Similarly, IMINT and COMINT can provide significant hard information (and a valuable check on HUMINT) on many aspects of suspected nuclear programmes. Gaseouos diffusion plants are reasonably conspicuous because of their large size and tremendous amounts of electricity that they use. Satellite imagery can show the presence of completed reactors, cooling towers, as well as facilities under construction. Moreover, communications between the different elements of a nuclear programme and between different elements and higher authority are subject to interception by space and other COMINT systems.[374]

iii... Suggestions for Making Use of Intelligence Facilities

If an effective coordination can be sustained between the IAEA and the advanced national technical means of states that possess them, there can be no doubt that the non-proliferation regime will function much more effectively. For this to happen, the necessary institutions should be established that would make it possible for the Agency and its member states to rely on the accuracy of the intelligence supplied. This can be in the form of a special unit to be established within the Agency, and consisting of qualified personnel experienced in intelligence gathering and evaluating issues. Their existence may make the national intelligence agencies of the IAEA member states share their findings with that special unit. There was endeed such a proposal in 1992 to set up a small staff dedicated to intelligence assessments. However, this did not materialize primarily because of political

[374]For a detailed coverage in these respects see, Jeffrey T. Richelson, "Can the Intelligence Community Keep Pace with the Threat ?", in Mitchell Reiss & Robert S. Litwak (eds.), *Nuclear Proliferation after the Cold War*, The Woodrow Wilson International Center for Scholars, Washington, 1994, pp: 291-308

opposition from nations fearful that the assesments would facilitate domination of less developed South by the highly industrialized North.[375]

In this regard the suggestion of David Kay as an experienced IAEA staff member also worths noting here. According to Kay, the UN Charter does provide an institutional mechanism that holds considerable promise for harnessing national intelligence efforts to international objectives. This is the Military Staff Committee envisaged by Article 47 of the Charter. This body, which was rendered moribund by the Cold War, is composed of representatives of all five permanant members of the UN Security Council and can be supplemented by other countries if needed.[376] It can also create subsidiary bodies. It would be appropriate to consider creating a Joint Intelligence Staff (JIS) under the Military Staff Committee, which would be the focal point for screening, analyzing, and reporting to the appropriate UN bodies those developments that might lead to threats to international peace and stability. The JIS would be the body responsible for protecting the sources and methods involved in collecting the information and for providing the Security Council and the IAEA with the necessary interpretative skills for understanding the data. In the case of information relating to nuclear proliferation, such a Joint Intelligence Staff could relay the information to the IAEA after having screened the information for its relevance and quality.[377]

F... Security Assurances

Measures envisaged so far, in order to prevent states from acquiring nuclear weapons (or the necessary nuclear infrastructure that may, one day in the future, be exploited to assemble nuclear weapons), mostly included prohibitive actions. This,

[375]For her comments see, Bailey, ibid., p. 73.
[376]A selection criterion may be applied similar to the one adopted for selecting the IAEA Board of Governors members
[377]David Kay, ibid., p. 327.

indeed, is a natural result of taking into consideration the incentives for states to pursue nuclear ambitions which emanate from various security considerations. Taking also into consideration that not all of the states, but a few, would be determined to seek for nuclear weapons capability regardless of the reactions of the rest of the world, several measures which may make the majority of states feel much safer would probably be effective in preventing an increase in the number of the determined states in the future. These measures may not have to be prohibitive, but rather persuasive by providing them with strong assurances against the use or threat of use of nuclear weapons. Two such measures exist, namely positive and negative security assurances, of which the former means a commitment by a nuclear-weapons state to come to help a states in case an actual use or a threat of use of nuclear weapons occurs against that state. Whereas, the latter denotes a commitment of a nuclear-weapons states that they will not use nuclear weapons against a non-nuclear weapons states provided that these states fulfil certain conditions (e.g., being a state party to the NPT or regional/multilateral nuclear restraint agreements such as the Tlatelolco Treaty etc..).

So far, all of the five *de jure* nuclear-weapons states have formally declared unilateral security assurances either by their representatives in the United Nations or by their foreign ministeries. The common point in these declarations was that they would not use nuclear weapons states against those states which renounced the production and acquisition of such weapons.[378] Moreover, as a consequence of the break-up of the Soviet Union, the five nuclear-weapons states being also the five permanent members of UN Security Council have issued, on 5 December 1994 in Budapest, memoranda on security assurances in connection with the accessions of

[378]The Soviet Union, in the statement made by the Minister of Foreign Affairs on 26 May 1978, further emphasized the non-deployment as important a condition as non-possession of nuclear weapons on the territories of states for making assurances effective. *Official Records of the General Assembly*, Tenth Special Session, Plenary Meetings, 5th meeting, paragraphs 84 - 85.

the nuclear-weapons capable former Soviet Republics (i.e., Kazakhstan, Ukraine and Belarus) to the Non-Proliferation Treaty having the status of non-nuclear-weapons states. In these memoranda the five nuclear-weapons states reaffirmed their commitment not to use nuclear weapons against them as they become party to the NPT as non-nuclear-weapons states. The five nuclear powers also reaffirmed their commitment to seek immediate United Nations Security Council action to provide assitance to these republics if they should become victims of an act of aggression or an object of a threat of aggression in which nuclear weapons are used.

There already exists a UN Security Council Resolution[379] in the same respect which recognizes that aggression with nuclear weapons or the threat of such aggression against a non-nuclear-weapon state would create a situation in which the Security Council, and above all its nuclear-weapons state permanent members, would have to act immediately in accordance with their obligations under the UN Charter.[380] Morover, in 1992, to deter proliferation of weapons of mass destruction, the President of the UN Security Council stated, on behalf of its members, that such proliferation would constitute a "threat to international peace and security", and that appropriate action would be taken to prevent it. However, this statement of the President of the UNSC has no binding legal effect. It should be converted into a formal decision of the Council to have such effect. The Council would then be entitled to take coercive measures under Chapter VII of the UN Charter.

Security assurances represent an important issue on the diplomatic agenda of the post-Cold War international system. Achievements of security assurances in the name of persuading states to refrain from nuclear option in their military structuring

[379] Resolution 255 (1968). Adopted by the Security Council on 19 June 1968.
[380] With this Resolution the Security Council reaffirmed the inherent right of individual and collective self-defense, as recognized under Article 51 of the Charter, if an armed attack ocurs against a member of the UN until the Security Council has taken measures necessary to maintain international peace and security.

will strengthen efforts to address security concerns particularly in the Middle East and South Asia. The Arab states of the Middle East, for instance, attribute a vital importance to a renewed and effective positive security assurance that would be pledged by the five nuclear-weapons states as one of the prinicipal conditions for the establishment of a Middle East Nuclear-Weeapon-Free Zone.[381] However, providing negative security assurance for supporting the establishment and effective functioning of NWFZs is more in the interest of nuclear-weapons states because of various political considerations.[382] In accordance with other developments in the nuclear non-proliferation field i.e., achieving a CTBT and a Cut-Off as well as an effective export control system, those steps which do not appear to be thinkable today may become feasible and more enhanced with the updated pledges of positive and negative security assurances of the nuclear-weapons states. Such an occurrance would surely contribute more to the maintenance of international peace and stability.

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[381]See, Mustafa Kibaroğlu, "Verification Provisions of a Nuclear-Weapons-Free Zone in the Middle East with Special Reference to EURATOM and ABACC, *The Turkish Yearbook of International Relations*, Ankara University Press, (forthcoming); See also, Mustafa Kibaroğlu, "EURATOM and ABACC: Safeguard Models for the Middle East" in Jan Prawitz and James F. Leonard (eds.), *A Zone Free of Weapons of Mass Destruction in the Middle East*, UNIDIR Research Report, New York & Geneva, pp: 93 - 123.

[382]Regarding the *de facto* nuclear-weapon status of Israel, it does not seem plausible to suggest the United States to provide positive security assurance to its Arab allies against Israel at the expense of detoriating its relations with this strategic ally. Neither India would like to depend on a Chinese security assurance as an *apriori* for a NWFZ in South Asia.

CONCLUSION

This study tried to find out what would be the measures which would be effective in the struggle against the danger of proliferation of nuclear weapons throughout the world. The existence of general principles, norms, rules and decision making procedures in this regard has formed the background of this study. Hence, the study of theory of international regimes provided valuable insights as to how the international efforts that culminated in the nuclear non-proliferation regime could be rendered more effective. In this respect, the writings of the leading scholars in the field of regimes theory suggested that, effectiveness of international regimes are closely linked, *inter alia,* to the effectiveness of the elements constituting the regime. Moreover, the importance of perception of actors that belong to the regime is also emphasized in the same context. In the light of the theory of international regimes, the need for overhauling the entire nuclear non-proliferation regime became obvious. Accordingly, the phases that the elements of the regime have passed through are investigated. The comprehensive research divulged the following results:

Essential elements of the nuclear non-proliferation regime (e.g., the NPT, and the IAEA Statute and its safeguards documents) have come about as the products of the lengthy deliberations in various international gatherings. These inter-state negotiations have mostly suffered divergence of views about the proposals for effective verification provisions. Thus, consensus on what would be an effective mandate for the IAEA was hardly attained in such meetings; sensitivity of states to their sovereignty, ideological confrontations, and the discriminatory norm of the non-proliferation regime between the nuclear *haves* and the *have-nots,* prevailed as major impediments to concluding more intrusive and more effective measures for verifying compliance of states with their basic undertakings; irreconcilable security considerations of various states emanating mostly from regional threat perceptions and manifold motivations of some radical regimes to acquire nuclear weapons complicated the task of settling up effective mechanisms for controlling the development of nuclear energy. Consequently, the nuclear non-proliferation regime suffered from loopholes and shortcomings.

Contrary to the inability of the regime to encompass the militarily significant states, regional non-proliferation initiatives appeared as feasible alternatives for associating them with the non-proliferation principle. Nuclear-weapon-free zones and the zones of peace, as well as bilateral nuclear restraint agreements cherished the ideal of a nuclear-weapon-free world. For instance, the African continent is in the process of becoming a nuclear-weapon-free zone. Adherence of South Africa to the NPT as a non-nuclear-weapon state abolished the obstacles on the way to the Pelindaba Treaty. The South Pacific is also becoming a nuclear-free zone in the real sense of the word. Because, in the past, regardless the declaration of the states in the South Pacific, the nuclear-free status of the region was not respected by the nuclear-weapons-states and particularly France conducted scores of nuclear tests.[383] The Argentine-Brazilian bilateral nuclear non-proliferation initiative which culminated in the Quadripartite Agreement revealed the significance of democratization and rational leadership for giving up nuclear ambitions. Moreover, the Treaty of Tlatelolco which established a nuclear-weapon-free zone in Latin America has become more effective with the ratification of these two significant states .

The study on the zonal agreements also revealed that the effectiveness and usefulness of such arrangements depend, to a great extent, on the attitudes of the nuclear-weapon-capable states (*de jure* or *de facto*) towards the zones. For instance,

[383] The pace of developments towards completing a comprehensive nuclear test ban affected the attitude of these states.

relentless arms race between the "superpowers" and their strategic relations within the military alliances made it difficult for them to refrain from deploying their nuclear forces almost anywhere on the globe.[384] Similarly, the existence of the so called *de facto* nuclear-weapons states in South Asia (India and Pakistan) and the Middle East (Israel) still make the establishment of such zones in these regions extremely difficult. The chain reaction of political, cultural, and religious factors obstructed any prospects in these respects. Hence, these examples demonstrated that political decisions prevailed in the debate for taking technically feasible measures against nuclear proliferation. Nonetheless, EURATOM instructed those who sought really effective and intrusive verification provisions in order to secure nuclear non-proliferation despite the political pressures from both inside and outside. EURATOM thus stood as an example of self-denial of a group of states that were politically and technologically capable to manufacture nuclear weapons.

Throughout the research it became equally obvious that, in the aftermath of the Cold War, it is uncertain whether the world will become a more secure place to live or not. The end of world-wide ideological confrontation between East and West is said to bring the so called North-South confrontation into the fore in world politics. In such a circumstance, advanced non-nuclear-weapon states of the North may feel threatened by the clandestine exploitation of nuclear energy by the states of the South. Hence, states from the North may decide to go nuclear should they anticipate that nothing could stop states from the South from acquiring nuclear weapons potential. As a matter of fact, with the advanced levels of technology at all respects, it would not take more than several months for states of the North to manufacture and stockpile a score of nuclear weapons together with their delivery vehicles. The likelihood of this briefly mentioned scenario is the 'nightmare' of many

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[384]One exception was Antarctica where heavy military deployment would have serious repercussions.

policy makers as well as scholars while, however, it impels them to search for feasible solutions to the nuclear predicament. Consequently, the research on what else should or could be done to strengthen the nuclear non-proliferation regime principally revealed that the existing mandate of the IAEA had to be reconsidered so as to vitalize the power of the Agency which is sometimes obliquely stated in the terms of the NPT and the related safeguards document INFCIRC/153. Hopefully, there are signs in this respect. The project undertaken within the IAEA by a group of experts, namely the "Programme 93+2" is a valuable work. It is hoped that the proceedings of the project will clarify more precisely what really is conferred to the IAEA in the internationally agreed documents, especially with regard to its power to conduct special inspections in the suspected installations of states party to the NPT regardless whether they are declared to the Agency or not. To complement such *internal* restorations within the regime elements, *external* steps should also be taken such as concluding a comprehensive nuclear test ban as well as a universal ban on the production of fissile material. Otherwise, it will certainly be very difficult to hinder the nuclear-weapons-capable states of the South to develop advanced generations of nuclear weapons (thermo-nuclear weapons which definitely require testing). These states may then be more willing and ready to transfer their first generation nuclear weapon manufacturing technologies to new aspiring states of the South. In that case, no matter how many sophisticated weapons are held in the arsenals of advanced states, they may not be capable of deterring the leaderships of the less developed states which may then possess first generation nuclear explosives. With the present level of nuclear technology such 'crude' nuclear explosives need not being tested. Given that fissile material and know-how are relatively more accessible today, first generation nuclear explosives may thus become the "poor man's atomic bomb" instead of chemical weapons, as they are usedto be.[385]

[385]Chemical weapons, which require much less investment and sophistication in manufacturing technologies, and which necessitate much more easily obtainable ingredients from the

Thus, if states fail to "plug the leaks" in the export control provisions and further institutionalize these "gentlemen's agreements", then the free flow of weapons-grade nuclear material, if coupled with the scientific and technical assistance, may eventually result in an increase in the number of *de facto* nuclear-weapons states around the globe. In addition to these measures, the extremely sophisticated technological products in the field of communications and intelligence gathering should be made available to states so that they should serve the non-proliferation ideal. The good-old ideological oppositions to reliance on the information supplied by such states as the United States or France should be put aside. Such oppositions should not become an instrument to cover the clandestine operations of several states. Instead, ways for making effective and accurate use of dependable intelligence data should be explored. All in all, concerted action of states at all respects should be achieved. *Otherwise, future generations may have to live in a world of nuclear crowd.*

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international markets, are long treated as powerful deterrents as nuclear weapons for those states which could not afford a clandestine nuclear weapons programme.

APPENDICES

APPENDIX A. CHARACTERISTICS OF ATOMIC BOMBS

Atoms consist of *protons, neutrons,* and *electrons*. Protons and neutrons bond together strongly to form a nucleus, and electrons orbit around them. The number of protons gives an atom its unique identity and a family name. All uranium atoms, for instance, have 92 protons, hence any atom with 92 protons must be a uranium atom. If a proton is added to an atom or taken from it, the atom's identity changes completely. Neutrons, on the other hand, can vary in quantity in the same kind of atom. For instance, some uranium atoms have 143 neutrons, while some have 146 neutrons. Atoms of the same family are called *isotopes*. The uranium isotope U-235, which is very rare in nature, is made up of 92 protons and 143 neutrons, whereas the more common isotope U-238 has 92 protons and 146 neutrons. A nuclear weapon is a device in which most or all of the explosive energy is derived from either fission, or fusion, or a combination of the two nuclear processes. Nuclear fission is the splitting of the nucleus of an atom into two or more parts. In nuclear fusion, however, light isotopes of hydrogen, usually deuterium and tritium, do join at high temperatures and similarly liberate energy and neutrons.

A... Fission Weapons

The basic nuclear weapon is the fission weapon (originally called the A-bomb) which relies entirely on a fission chain reaction to produce a very large amount of energy in a very short time -roughly a millionth of a second - and therefore a very powerful explosion.[386] Nuclear fission occurs when a neutron enters the nucleus of an atom. Many heavy atomic nuclei are capable of being fissioned, but only a fraction of these are fissile, which means fissionable by neutrons with a wide range of velocities. It is this property of the fissile material principally highly enriched

[386]Frank Barnaby, *How Nuclear Weapons Spread: Nuclear-Weapon Proliferation in the 1990s*, Routledge, London and New York, 1993, p. 27.

uranium U-235 and plutonium Pu-239, that allows a chain reaction to be achieved in weapons employing the fission process.[387] Highly enriched uranium or plutonium atoms, when bombarded by neutrons, do split, release energy and emit additional neutrons. In a controlled chain reaction, the previously emitted neutrons hit the previously splitted atoms by further splitting them into lighter atoms and releasing tremendous energy.[388] With each successive fission *generation* additional energy is released, and, if the fission of one nucleus induces an average of more than one fission in the following generation, the energy yield of each generation is multiplied.[389]

The U-235 isotope of uranium is highly unstable, and this property makes it easier to split than the other uranium U-238 isotope. In a reactor, a neutron which is fired at a U-235, attaches itself to the atom, increasing its instability, which in turn causes the atom to split and release energy. The same neutron directed at a more stable U-238 atom would likely be absorbed without fissioning (i.e., without causing split). In a reactor, many neutrons are intercepted by U-238 atoms, and others are absorbed by the atoms of other materials in the reactor. Still others escape from the reactor completely. In sum, the fission process might be imagined as involving the following components:

1... the *targets,* i.e., the U-235 atoms, whose capture and fissioning releases atomic energy;

2... the *arrows,* i.e., the neutrons, which attack the U-235 targets or seek to escape;

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[387]In theory, Thorium (Th), as another fissile material, can also be used. When the nucleus of the isotope Th-232 captures a neutron becomes Th-233 which undergoes radioactive decay to U-233 which is fissile like U-235 or Pu-239. However, Thorium has not been used in nuclear weapons.

[388]Fissioning of one kilogram of uranium releases as much energy as the burning of 2,000 tons of coal. See, Anthony Nero, *A Guidebook to Nuclear Reactors, Berkeley, University of California Press*, 1979, p. 4.

[389]A fission explosion in the range of 1 to 100 Kt for example, would occur over a few microseconds and involve over fifty generations with 99.9 percent of the energy released coming in the last seven.

3... the *interceptors,* i.e., the U-238 atoms, which defend the U-235 targets by absorbing neutron arrows.

The fissioning of a U-235 atom in turn releases two or three of its own neutrons. If at least one of these is successful in splitting another U-235 atom, a self-sustaining chain reaction will be established which will produce a steady output of energy in a nuclear reactor. The two parts into which a fissioned uranium nucleus splits are called fission products, and are normally radioactive isotopes.

i... Moderators

If a chain reaction involves enough atoms in a fraction of a second, as in a nuclear bomb, a tremendous explosion results. Without human intervention, the situation is not favourable for sustained fissioning of U-235 atom. Since, as noted earlier, the U-235 isotope is rare in nature, whereas the U-238 isotope is 140 times more common in natural uranium than the U-235 isotope. The rare U-235 isotopes are well defended by the abundant U-238 isotopes. Hence, neutrons which are normally too fast, can hardly attach themselves to U-235 isotopes to split them. To overcome such obstacles, several methods are available for slowing down the neutrons. In a nuclear reactor this is done by means of moderators which are materials as either *light-water,* or *heavy-water,* or *graphite,* that surrounds the nuclear fuel in the reactor core.

When neutrons collide with the heavy water or graphite atoms, they decelerate to a speed that greatly improves their chances of attaching to a U-235 atom and causing it to break apart. In reactors moderated by these materials, no other adjustments are necessary to make fission possible. When light (ordinary) water is used as a moderator, however, some neutrons are slowed, but others are absorbed by the light-water itself. Because ordinary water is plentiful and cheap when compared to heavy-water which is costly and very difficult to make, light-water is the preferred moderating material. To make use of light water, the proportion of U-235 in the reactor should be higher in order to increase the likelihood of a successful chain reaction. Therefore, in light-water reactors, uranium used must be enriched in U-235. In case the percentage of U-235 atoms in the reactor fuel is increased to 90 percent or higher, neutrons become able to fission U-235 without being slowed by a moderator. Hence, the use of fast neutrons and highly enriched uranium is the characteristic of nuclear bombs and of the so-called fast reactors.[390]

ii... Uranium, Plutonium & Thorium

Another important event in the reactor core that increases the chances of successful fission is the transforming action of attacking neutrons. It was already noted that neutrons that are unsuccessful in splitting U-235 atoms are absorbed by U-238 atoms or other materials, or they escape the reactor entirely. Indeed, the neutrons captured by U-238 are not entirely wasted. Having failed to find and split a U-235 nucleus, these neutrons serve to convert the nonfissile U-238 into fissile plutonium Pu-239. This conversion process, too, like enrichment process requires successful achievement of several steps and sophistication. Once this transmutation is achieved, another fissile target has been created for other flying neutrons to attack. In fact, approximately 30 percent of the power generated by a nuclear reactor comes from the fissioning of plutonium created through this transmutation process. The same process takes place when thorium, which is occasionally used in nuclear fuel, absorbs a neutron and eventually creates U-233 as another fissile material. Nature supplies only one fissile isotope U-235, but scientists have created two others,

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[390] In contrast to heavy-water and graphite moderated reactors, which use natural uranium as fuel, a light-water moderated reactor would necessitate use of low-enriched uranium, implying that an enrichment capability may be available. If so, highly enriched uranium could, in theory, be produced, obviating the need for plutonium as a weapons material. It is also possible that a state might import fuel for a light-water reactor under IAEA inspection, and after using the material to produce electricity, reprocess it to extract plutonium. Although IAEA rules would require the country involved to place any such plutonium under IAEA monitoring, the state might one day abrogate its IAEA obligations and seize that material for use in nuclear arms.

namely Pu-239 and U-233. All three are useful in varying degrees for generating nuclear power, and all three can contribute to a nuclear explosive capability.

iii... Critical Mass

Atomic bombs are designed to keep the fission process going until their materials are so hot that they vaporize, reach a very high pressure, and then explode. The uncontrolled fissioning process in a nuclear bomb is possible only when a certain amount of fissile material, called *critical mass,* is present. At sub-critical amounts of fissile material, many neutrons escape and leave too few neutrons available to fission other atomic nuclei. A critical mass of nuclear material, however, is large enough to maintain a nuclear reaction even after neutrons are lost to the outside environment. The critical mass depends on a number of factors: first, the nuclear properties of the material used for fission, whether it is U-235 or Pu-239; second, the shape[391] of the material; third, the density[392] of the material: fourth, the purity of the material; and fifth, the physical surrounding of the material used for fission.

Since, the critical mass of material necessary to sustain a chain reaction may be lowered by increasing the material's density through *compression,* or by surrounding it with *reflectors* to minimize the escape of neutrons, it is therefore difficult to pin down the precise amount of uranium or plutonium required for a bomb.[393] Two

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[391]A sphere is the optimum shape because, for a given mass the surface is minimized , which in turn minimizes the number of neutrons escaping through the surface per unit time.

[392]The higher the density the shorter the average distance travelled by a neutron causing another fission and therefore the smaller the critical mass.

[393]The critical mass of, for example, a sphere of pure Pu-239 metal having a density of 19.8 grams per cubic centimeter (the densest for of the metal) is about 10 kilograms. The radius of the sphere is about 5 centimeters. If the plutonium sphere is surrounded by a natural uranium neutron reflector, about 10 centimeters thick, the critical mass is reduced to about 4.4 kilograms, having the shape of a sphere of radius of about 3.6 centimeters. A 32-centimeter thick beryllium reflector reduces the critical mass of densest Pu-239 to about 2.5 kilograms, with a sphere of radius of 3.1 centimeters. For detail see, Frank Barnaby, ibid., p. 28.

basic nuclear fission weapons design approaches that are used to achieve a supercritical mass, are:

a... the implosion technique

A peripheral charge of chemical high explosive is uniformly detonated to compress a subcritical mass of plutonium or highly enriched uranium into a supercritical configuration. When the conventional explosives surrounding the sub-critical mass of nuclear material are detonated simultaneously, the pressure on the central core of nuclear material is so great that it compresses the material to criticality. Under appropriate conditions, the rate at which fissions occur then increases greatly and energy is released so rapidly that a nuclear explosion results;

b... the gun assembly technique

Two or more subcritical masses of highly enriched uranium (plutonium cannot be used) are propelled together by a conventional explosion, resulting in a supercritical mass. The conventional high explosives used to compress the spherical fissile core of a nuclear weapon are one of the most crucial components. If the compression is not symmetrical or rapid enough the nuclear explosion will not reach its predicted explosive yield.[394] Normally, the more explosive charges there are the more perfect is the spherical symmetry of the shock wave.

In both cases, the conventional explosive used to compress the fissile material at sub-critical level, is placed outside a tamper (converter). The tamper has two functions: first, since the tamper is made of heavy metal, its inertia helps hold together the plutonium or highly enriched uranium to prevent the premature disintegration of the fissioning material and thereby obtain a greater efficiency. Second, the tamper converts the divergent detonation wave into a convergent shock

394 The bomb dropped on Hiroshima was of this type.

wave to compress the plutonium or highly enriched uranium sphere. The tamper may also serve to reflect back into the fissile material some of the neutrons which escaped through the surface of the fissile material core to minimize the mass of that material needed.[395]

B... Fusion Weapons

If explosions in the range of a few thousands of kilotons are required, that extra high energy can be obtained from fusion. The fusion process is the opposite of fission. Fusion of light atomic nuclei requires a high density of fusion material and an extraordinary amount of heat (hundred million degrees or so), both of which are provided by a fission explosion in a *thermonuclear* or *hydrogen* bomb. Lithium-6 deuteride is the most widely used thermonuclear material, serving as a source of both deuterium and tritium, the atoms whose nuclei merge, in a fusion weapon. There is no critical mass for the fusion process, therefore, in theory, there is no limit to the explosive yield of fusion weapons.

In a boosted weapon, fusion material is introduced directly into or next to the core of fissile material, improving the efficiency of a fusion weapon and thus increasing the yield of a given quantity of highly enriched uranium or plutonium. Although energy is released in the fusion reaction of a boosted weapon, the primary contribution of the fusion material to the explosion is that it provides additional neutrons for the fission process and therefore allows a more rapidly multiplying chain reaction to occur. Other thermonuclear weapons are designed to capitalize on the energy released in a *secondary fusion* reaction triggered by a *primary fission* explosion. In such devices, fusion material is kept physically separate from a fissile or

[395]In some designs the reflector is of a different material from the tamper, in which case the plutonium sphere is surrounded by another spherical shell, situated between the plutonium and the tamper. Beryllium is a good neutron reflecting material. See, Frank Barnaby, ibid., pp: 30 - 31.

boosted fissile core that compresses and ignites it. Additional stages of fusion or fission material may be included to augment the weapon's yield, with each layer being triggered by ones closer to the core. The hydrogen bomb includes a third stage or blanket of natural uranium, that is a widely available fissionable but not fissile material, which is fissioned by fast neutrons from the primary fission and secondary fusion reactions. Hence, the energy released in the explosion of such a device stems from three sources: a fission chain reaction; burning of the thermonuclear fuel; and fission of the U-238 blanket. Very roughly, fission and fusion reactions generate the both halves of the total energy.

APPENDIX B. MANUFACTURING NUCLEAR WEAPONS & THE NUCLEAR FUEL CYCLE

A nation seeking to manufacture nuclear weapons must complete a number of essential, often extremely demanding steps.

1... it must *develop a design* for its nuclear device or obtain such a design from another state;

2... it must *produce the fissile material* for the core of the device or obtain it from external source and must then machine the fissile material to fabricate the nuclear parts of the weapon;

3... it must *fabricate*, or obtain from outside, *the non-nuclear parts* of the device, including the high-explosive elements and triggering components that will detonate the nuclear core;

4... it must *verify* (test) *the reliability* of these various elements individually and as a system; and

5... it must *assemble* all of these elements into a *deliverable* nuclear armament.

A... Design of an Atomic Bomb

It is generally accepted today that designing an atomic bomb, that is drawing its blueprints, is within the capabilities of quite a number of nations. Several states are believed to have received nuclear weapons design informations or assistance from other states. France and Israel, for example, are believed to have collaborated on the design of French nuclear weapons, in the late 1950s and early 1960s, after which France is thought to have provided Israel with information from a number of its nuclear tests. China, similarly, is believed to have provided Pakistan with the design of the nuclear device that it detonated in its fourth nuclear test, which involved firing of a nuclear-armed missile. India, however, apparently designed the plutonium-based *implosion* device that it detonated in 1974 without outside assistance, and South Africa also apparently designed its uranium-based *gun-type* nuclear weapons without foreign aid.[396]

B... Acquiring Fissile Material

The major technical barrier to making a nuclear device is obtaining the fissile material, i.e., the weapons-grade uranium or plutonium, for the weapons core. How much would be needed for a nuclear weapons depends on the technical capabilities of the country involved and the size of the weapon it sought to produce. International Atomic Energy Agency regulations assume that 25 kg of weapons-grade (i.e., highly enriched) uranium or 8 kg of plutonium are the minimum amounts needed to manufacture a nuclear device with a yield of 20 Kilotons, roughly the size of the Nagazaki bomb. However, by utilizing more sophisticated designs that rely on high compression of the core material, a state could build such a weapon with considerably less material. According to one recent estimate, a country possessing a low technical capability could build a 20 kilotons device with only 6 kg of plutonium or 16 kg of highly enriched uranium. A state with high technical capability, on the other hand, could potentially build such a device with as little as 5 kg of highly enriched uranium or 3 kg of plutonium. Moreover, a 1 Kt device, which would require considerable sophistication to manufacture, might need only about half these amounts[397]

C... Nuclear Fuel Cycle

The diversion of natural uranium into weapons-usable uranium requires several steps, which is usually called nuclear fuel cycle. In the basic cycle, uranium is

[396]See, Leonard S. Spector, Mark G. McDonough with Evan S. Medeiros, *Tracking Nuclear Proliferation: A Guide in Maps and Charts. 1995,* Carnegie Endowment for International Peace, Washington D.C., 1995.

[397]See, Thomas B. Cochran and Christopher E. Paine, *The Amount of Plutonium and Highly Enriched Uranium Needed for Pure Nuclear Weapons*, Natural Resources Defense Council, Washington D.C., 1994.

mined, refined, processed into an appropriate chemical form, converted into fuel rods, fissioned (burned) in a reactor, and stored as waste. However, variations of this cycle are necessary to accommodate different reactor types. The uranium enrichment stage, for example, is needed to prepare fuel for use in light-water reactors, whereas heavy-water production is the prerequisite of supplying the moderator for heavy-water reactors, unless heavy-water is acquired from external sources.[398] In addition, both reactor types may operate on a *once-through fuel cycle* (spent fuel is not recycled), or on a *plutonium fuel cycle*, which provides for extraction and re-use of plutonium spent fuel rods. This extraction process is an additional sensitive stage in the fuel cycle known as reprocessing.[399]

For illustrative purposes, the basic nuclear resources and facilities that would be needed to produce weapons-grade uranium indigenously include:

1... uranium deposits;

2... a uranium mine;

3... a uranium mill for processing ore usually less than one percent uranium into uranium oxide concentrate, or as usually called *yellow cake;*

4... a conversion plant for purifying yellow cake and converting it into uranium hexafluoride (UF_6), or uranium tetrachloride (UCl_4) the material processed in the enrichment plant;

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[398]Although technically not part of a fuel cycle, heavy-water production is important as an important auxiliary component of the heavy-water reactor fuel. Because reactors moderated by heavy water can fission natural uranium, the expensive and difficult step of enriching uranium is unnecessary. Heavy-water production is itself a difficult process, but is not beyond the capability of most industrialized nations. The United States, Canada, Russia, and Norway are the producers of heavy-water, and India is the world leader in the production of this material. Several hundreds of cubic meters of heavy waters are used to moderate a medium-sized heavy-water reactor.

[399]The plutonium fuel cycle inflicted a debate among the scientists. The proponents argue that it requires far less fresh uranium fuel and produces lower quantities of nuclear waste than a once-through fuel cycle. Opponents claim that waste levels under the two are similar. More significantly, opponents worry that the huge amounts of recycled plutonium made available at power plants all over the world would significantly increase the chances of illicit purposes. They point out that all fissile material in the once-through fuel cycle remains in a form not directly usable for weapons. See, Anthony Nero, ibid., also see, Gary T. Gardner, *Nuclear Nonproliferation: A Primer*, Lynne Rienner Publishers, Boulder, Colorado, 1994,

5... an enrichment plant for enriching the uranium hexafluoride gas or uranium tetrachloride in the isotope U-235;

6... a capability for converting the enriched uranium hexafluoride gas or uranium tetrachloride into solid uranium oxide or metal.[400]

i... Mining & Milling

Uranium ore is found in places close to the earth's surface, and must be mined like any other mineral. Excavated uranium ore is milled to separate uranium from foreign matter. The uranium is then processed into a chemical form U_3O_8 called *yellow cake,* named for its amber color. The world leaders in uranium mining and milling are Canada, the United States, Australia, France, Niger, Namibia, and South Africa. According to the London based Uranium Institute, excluding the former Soviet Union and the P. R. of China, a total of 28,360 tons of uranium were produced commercially in 1990, considerably less than the 43,800 tons produced in 1980 (the average annual production in the 1980s was 38,200 tons).[401] About 5,000 kilograms of natural uranium are needed to produce the 25 kg of weapons-grade uranium for one atomic bomb.

ii... Conversion

At the conversion stage, the processed natural uranium is converted to a form usable in a nuclear reactor. If the material is intended for use in a heavy-water reactor which burns natural (nonenriched) uranium, it is converted to uranium metal or uranium dioxide (UO_2). Uranium destined for light-water reactors is converted to uranium hexafluoride, a gas suitable for the enrichment process.

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[400]The conversion of uranium hexafluoride into uranium oxide or metal is often associated with a yellowcake-to-hexafluoride conversion plant.

[401]Canada accounted for 30 percent of the total uranium produced in 1990 (in seven uranium mines); the United States for 14 percent (in eleven mines) Australia for 12 percent (in two mines); Namibia for 11 percent (in one mine); France and Niger for 10 percent each (in thirty-five mines); South Africa for 9 percent (in seven mines); and Gabon for 2.4 percent (in one mine). For details, see Frank Barnaby, *How Nuclear Weapons Spread* ..., p. 4.

iii... Enrichment

To make weapon from uranium, the unstable U-235 isotope of uranium is used. Since natural uranium consists of less than one percent of U-235 (approximately 0.7 percent), while in nuclear weapons 90 percent or more of U-235 must be used, the percentage of natural uranium must be upgraded or enriched at an enrichment plant to achieve this concentration. Indeed, technically a weapon could be made of uranium enriched to more than 20 percent.[402] Because U-235 and U-238 are chemically identical, it is necessary to use a physical method to separate and enrich them. Uranium enrichment is a highly complex process and requires considerable investment. For this reason, the uranium enrichment route was generally considered a less likely path to proliferation than the plutonium option.[403] Enriched uranium can also be used as a fuel in nuclear power reactors, research reactors, or naval propulsion reactors. The power reactors used in the United States and most other countries that are called *light-water reactors* use low-enriched uranium fuel (i.e., uranium that has been enriched from 3 to 5 percent U-235.[404] Thus, a country can have entirely legitimate, non-weapons related reasons for developing uranium enrichment technology even though the same technology can be used to upgrade uranium to the high enrichment level useful for nuclear weapons. On the other hand, developing a sizeable independent uranium enrichment capability is economically justifiable only for nations with large domestic nuclear power programs or significant potential export markets.[405] Several

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[402]As a practical matter, material enriched to more than 90 percent is preferred. For instance, the bombed dropped on Hiroshima used uranium enriched to 80 percent. Similarly, South Africa's first nuclear device used material enriched to 80 percent for the first device and 90 percent for the remaining 5 nuclear weapons.

[403]Argentina, Brazil, Iraq, South Africa, and Pakistan with extensive aid obtained mostly by clandestine means, all selected uranium enrichment capabilities. India and Israel, although they have relied on the production of plutonium for their nuclear weapons capabilities, have also conducted research on uranium enrichment. India is known to have two experimental plants. The status of Israel's enrichment program is not publicly known. For details and the current status of these efforts, some of which have been terminated, see Leonard S. Spector *et al*, ibid.,

[404]Technically, low enriched uranium is defined as uranium enriched to less than 20 percent in the isotope U-235. Such material cannot be used in the core of a nuclear device.

[405]Because highly enriched uranium is sometimes used to fuel research reactors, a nation can have legitimate reasons for obtaining quantities of this material, despite its usefulness in nuclear

methods have been developed for enriching uranium, all of which ultimately rely on differentiating among the isotopes of uranium and isolating material with increased concentrations of U-235.

a... gaseous diffusion method

The most widely used enrichment method, gaseous diffusion dates back to the Manhattan Project. Uranium in a gaseous form, i.e., uranium hexafluoride, is forced through a series of membranes of a huge container. Each membrane allows the lighter U-235 atoms to pass through more easily than the heavier U-238 atoms. After penetrating each membrane, the gas is richer in U-235 than it was originally, but only slightly. Normally, 1,250 passes are needed to enrich the gas to 3 percent U-235, which is the enrichment level used in most light-water nuclear power plants. However, 4,000 passes are required to enrich the material to the weapons-grade of 90 percent U-235. Gaseous diffusion is a technically complex process that requires massive amounts of electricity. For illustrative purposes, a typical enrichment facility in operation use about 5,000 MW of electricity. This amount is as much as the electricity consumed by a city of several million people. Therefore, the need for such a tremendous amount of electricity makes clandestine acquisition of a gaseous diffusion plant difficult.[406]

b... gas centrifuge method

The ultra-centrifuge or gas centrifuge method uses centrifugal force to draw U-238 atoms away from the desired U-235 atoms. When uranium hexafluoride is spun in a centrifuge, the heavier U-238 atoms gravitate toward the outer walls, whereas the lighter U-235 atoms remain in the center. The centrifuge method requires only

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explosives. In recent years, the United States and France have developed lower enriched uranium fuels that can be used in lieu of highly enriched material in most of these reactors, considerably reducing the proliferation risks posed by fuel from these research facilities.

[406]See, Gary T. Gardner, ibid., pp: 11 - 23.

35 repetitions to achieve weapons-grade uranium. A plant with 1,000 centrifuges can supply the uranium stock for several nuclear weapons per year. The relatively low power requirements of the gas centrifuge method of enrichment, coupled with its relative efficiency, make it an enrichment process of high proliferation concern.[407]

c... aerodynamic method

Along with the above mentioned principal methods used for uranium enrichment, there are few other methods, too. Some of these methods are outdated, such as the *Electro-Magnetic Isotope Separation* (EMIS) method that uses uranium tetrachloride, which is an inefficient, but less complex method, that was abandoned in the 1950s.[408] Another enrichment method is the *aerodynamic method.* Like the gas centrifuge enrichment method, the aerodynamic method uses centrifugal force to separate U-238 from the bulk of the uranium stock. Uranium gas is blown over a curved surface, which has the effect of separating the heavier U-238 from the lighter U-235. Six hundred repetitions of this process are needed for 90 percent enrichment. This process as well requires tremendous amounts of energy.

d... laser method

Considerable research and development has been conducted on additional enrichment techniques, such as the *laser isotope separation,* but they are not used in the commercial production of enriched uranium for weapons manufacturing purposes. Laser method is still in the development stages. The method of enrichment uses different light waves to excite particular atoms while leaving others unaffected. The excited atoms can then be separated from the others. This method is so precise that only one pass is necessary to complete the enrichment process, and it

[407]See, William C. Potter, *Nuclear Power and Nonproliferation: An Interdisciplinary Perspective*, Oelgeschlager, Gunn & Hain Publishers, Cambridge, Massachusetts, quoted in Gary T. Gardner, ibid., p. 22.
[408]Iraq, however, unexpectedly revived this option in the 1980s as part of its nuclear weapons program.

can be used on wastes remaining from other plants. Laser method appears to be out of the reach of most nations of current proliferation concern.[409]

iv... Fuel Fabrication & Fuel Burn-up

Before enriched uranium (or plutonium) can be used in a nuclear reactor, it must be fabricated into *fuel rods.* The enriched uranium, plutonium, or natural uranium used in heavy-water reactors is shaped into cylindrical pellets, which are then stacked in tubes called fuel rods. The rods are then bundled together into fuel *assemblies*.[410] Fuel rods fabricated for use in heavy-water reactors contain natural uranium, whereas those destined for use in light water reactors contain low-enriched uranium. In the reactor core the rods are irradiated as a controlled fission reaction is begun. Approximately 180 fuel assemblies containing about 110 tons of uranium are needed to fuel a typical 1,000 MW light-water reactor for three years.[411] The quantity of fissile uranium is reduced as the fuel is burned up, but plutonium is produced in its place.

v... Nuclear-Power Reactors

A nuclear-power reactor is basically a furnace where the heat produced by a controlled chain reaction is used to generate electricity. Typically, the heat used to turn water into steam issued to drive a turbine which generates electricity. A typical modern power reactor generates about 1,000 million watts (1,000 MW) of electricity, enough to supply the domestic and industrial electricity for, for example, a modern city of about 1 million people. In a typical nuclear-power reactor, the fuel is in the form of a number of cylindrical fuel elements. Heat is removed from the fuel elements by a coolant, such as water, which flows over them. The coolant then flows

[409] See, Gardner, ibid., p. 23.
[410] Light-water reactor fuel assemblies each weigh from 200 to 500 kg. Each pair of assemblies are shipped enclosed in steel containers to prevent damage.
[411] See Mason Willrich and Theodore B. Taylor, *Nuclear Theft: Risks and Safeguards*, Ballinger Publishing Co., Cambridge, Massachusetts, 1974, cited in Gary T. Gardner, ibid., p. 17.

through a heat exchanger where it turns water in a secondary circuit into steam to drive the turbine. The fuel, moderator and coolant form the core of the reactor, which is usually surrounded by a layer of material, such as graphite or natural uranium, which reflects back into the the core many neutrons which would otherwise escape, contributing to the efficiency of the reactor.[412]

vi... Plutonium

Like the production of enriched uranium, the production of plutonium entails many steps, and many installations and capabilities besides the reactor and reprocessing plant are needed. For illustrative purposes, the following facilities and resources would be required for an independent plutonium production capability assuming that a research or power reactor, moderated by either heavy-water or graphite, and employing natural uranium fuel, were used:

1... uranium deposits;

2... a uranium mine;

3... a uranium mill for processing uranium ore containing less than 1 percent uranium into uranium oxide concentrate, or yellow cake;

4... a uranium purification plant to further improve the yellow cake into reactor-grade uranium dioxide;

5... a fuel fabrication plant to manufacture the fuel elements placed in the reactor, including a capability to fabricate zircaloy or aluminum tubing;

6... a research or power reactor moderated by heavy-water or graphite;

7... a heavy-water production plant or a reactor grade graphite production plant;

8... a reprocessing plant.

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[412]Various types of nuclear-power reactors are possible, based on different combinations of fuel, moderator material, and coolant. But only three types have significant commercial importance. In them, the material used as the moderator is graphite, ordinary (light) water or heavy-water (in which hydrogen is replaced by deuterium); and the coolant is gas (such as carbon dioxide), light water or heavy water. See, Frank Barnaby, ibid., pp: 8-9.

a... reprocessing

A reactor can be designed specifically to maximize plutonium production, that is a production reactor, a large research reactor, or a power reactor for producing electricity. Uranium fuel, usually in the form of uranium-filled tubes (fuel rods) made of zirconium alloy (zircalloy) or aluminum, is placed in the reactor. For most production and power reactors and many large research reactors, the fuel itself is either natural or low-enriched uranium, which is not usable for weapons at that point. As the reactor operates, the uranium fuel is partly transformed into plutonium. This is amalgamated in the fuel rods with unused uranium and highly radioactive waste products, and it must then be extracted. To do the extraction operation, the *spent fuel* rods are taken to a reprocessing plant where they are dissolved in nitric acid and the plutonium is separated from the solution in a series of *chemical reprocessing* steps.

b... extraction

After burn-up, the fuel rods must be replaced with fresh fuel. The rods, that are depleted of U-235 but rich in plutonium, are removed from the reactor and cooled for several months in pools of fresh water. Spent-fuel rods are removed from storage pools and sent to a reprocessing plant for plutonium extraction. The rods are cut into pieces and dissolved in acid. Using the Plutonium Uranium Recovery by Extraction (PUREX) method, more than 90 percent of the uranium and plutonium in the spent-fuel solution can be recovered. Uranium emerging from this process typically contains only 1 percent U-235. However, the plutonium obtained from the reprocessing operation can be converted to a form usable for nuclear weapons. Reprocessing of the highly radioactive spent fuel is done by remote control from behind thick walls.[413] The separated plutonium and uranium are virtually

[413]Since the spent fuel rods are highly radioactive, heavy lead casks must be used to transport them. In addition, the rooms at the reprocessing plant where the chemical extraction of the plutonium occurs must have tick walls, lead shielding, and special ventilation to prevent radiation

inaccessible during this operation. hence, unsafeguarded material in a reprocessing plant could easily be diverted to a nuclear weapon. High plutonium extracted from low burn-up fuel (e.g., from a production reactor or heavy-water natural uranium research reactor) is directly usable in a nuclear weapon. However, plutonium derived from the high burn-up fuel of the standard light-water reactor is not the preferred material for nuclear weapons, but could be used as a nuclear explosive by those who are not concerned with obtaining the highest possible yield.

D... Debate Over Plutonium Production

Like uranium enrichment facilities, however, spent-fuel reprocessing plants can also be used for legitimate civilian purposes, because plutonium can be used as fuel in nuclear power reactors. Indeed, through the 1970s it was generally assumed that as the use of nuclear power grew and world-wide uranium resources were depleted, and therefore plutonium extracted from spent fuel would have to be *recycled* as a substitute fuel in conventional power reactors. In addition, research and development is under way in a number of nations on a new generation of reactors known as *breeder reactor,* most notably in France, Japan, and Russia. Breeder reactors use mixed plutonium-uranium fuel surrounded with a *blanket* of natural uranium. Hence, as the reactor operates, slightly more plutonium is created in the core and the blanket together than is consumed in the core, thereby *breeding* new fuel.

Like plutonium recycling, the economic advantages of breeders depends on natural uranium's becoming scarce and expensive. However, over the past two decades new uranium reserves have been discovered. Nuclear power has reached

hazards. Although detailed information about reprocessing was classified by the United States and France in the 1950s and is generally available, it is still a complex procedure from an engineering point of view. Indeed, many nations such as India, Iraq, Israel, and Pakistan, that have tried to develop nuclear weapons via the plutonium route, have sought outside help from the advanced nuclear supplier countries. Notwithstanding, North Korea has apparently succeeded in constructing a reprocessing facility at Yongbyon without such foreign assistance.

only a fraction of its expected growth levels. Moreover, reprocessing spent fuel to extract plutonium has proven far more expensive and complex than anticipated. Furthermore, concern over the proliferation risks of wide-scale use of plutonium as a fuel has grown. These factors led the United States in the late 1970s to abandon its plans to recycle plutonium in light-water reactors and, in the early 1980s, to abandon its breeder reactor development program. Currently the United States is phasing out its recycling of plutonium. Great Britain, too, has frozen its development of breeder reactors, although it is continuing to reprocess spent fuel on a commercial basis for itself and several advanced nations.

The principal proponents of the use of plutonium for civilian purposes are France, Japan, and Russia, which are all continuing to develop the breeder reactor option and are moving forward with sizeable plutonium recycling programs. Belgium and Switzerland, although they do not have breeder reactor programs, are using increasing amounts of recycled plutonium in light-water reactors. Broadly speaking, the proponents of nuclear energy in these countries have maintained support for the civil use of plutonium by arguing that, although it may not be economical, it represents an advanced technology that will pay off in the future and will reduce dependence on foreign sources of energy. A new factor that will affect the economics of civil plutonium use is that many hundreds of tons of low-enriched uranium produced by blending down weapons-grade uranium from dismantled Russian nuclear warheads will soon be added to the international power-reactor fuel market. This will keep prices of this material low and should reduce the attractiveness of high-cost plutonium fuel cycles. Whatever the thrust of their domestic nuclear programs, the advanced nuclear supplier countries are strongly discouraging plutonium's use by nations of proliferation concern. The long-standing view that plutonium is a legitimate and anticipated part of civilian nuclear programs, however, has allowed India and North Korea to justify their reprocessing programs, even though such efforts provided these nations with a nuclear weapons manufacturing capability.[414]

E... Acquisition of Fissile Material & Technology from Abroad

Nations wishing to obtain highly enriched uranium and/or plutonium, without international restrictions prohibiting their use for nuclear explosives, would have to develop uranium enrichment and reprocessing technologies independently, or obtain them illegally. Virtually all nuclear exporter states are unwilling to sell nuclear equipment and materials unless recipients pledge not to use them for nuclear explosives and agree to place them under the inspection system of the IAEA. Although, historically, every state that has developed nuclear weapons has also built an indigenous capability to produce fissile material for this purpose, the weakening of controls over such material in the former Soviet Union has increased the possibility of its becoming available on an international black market. In Russia, during 1994, the smuggling of plutonium and weapons-usable enriched uranium, apparently of Russian origin, was observed for the first time.[415] The widespread availability of clandestine supplies of weapons-usable nuclear materials could greatly accelerate the pace at which emerging nuclear powers could develop nuclear arms and simultaneously undermine the inspection and auditing system of the IAEA.

F... Testing

It is generally assumed that by rigorously testing the non-nuclear elements of a nuclear device and performing computer simulations, a state could build a reliable first-generation fission weapon without having to conduct a full-scale nuclear test. The greatest confidence could be achieved with a uranium-based, gun-type weapon. The United States, for example, was so confident that the gun-type Hiroshima bomb

[414]For further discussions in these respects see, Leonard S. Spector *et al.*, ibid., p. 173.
[415]A detailed and up-to-date discussion exists in Leonard S. Spector *et al.*, ibid., pp: 59 - 82.

would work as designed that it did not need to conduct a test of the device before it was used against Japan. The Trinity test, on the other hand, was of the more complex implosion-type bomb, that was later used against Nagasaki. South Africa employed a gun-type design and is not known to have conducted a nuclear test.[416]

Although a full-scale nuclear detonation may not be essential to develop a reliable nuclear weapon, of the three current *de facto* nuclear powers, India conducted such a test, while Israel and Pakistan received assistance from more advanced countries, which may be deemed the equivalent of such experimental proof of design. Since Israel thought to have boosted fission weapons but is not known to have conducted a nuclear test, building reliable versions of such weapons without testing appears possible. However, to build multi-stage hydrogen bombs, which are far more complex, nuclear testing would be required.

G... Non-Nuclear Components, Assembly & Delivery

Finally, the manufacture of nuclear weapons requires the design and the fabrication of: specially designed high-explosive components to compress the fissile material core of the device; high-speed electronic firing circuits, or *triggering packages* to set off the high-explosives uniformly at precisely the correct instant; and an initiator (an intense source of neutrons to initiate the nuclear chain reaction in the core). Developing all these components necessitates considerable technical skill and, though less demanding than producing fissile material, can nonetheless be quite challenging.[417] Assembly of the completed components of nuclear weapons and delivery by aircraft are relatively less demanding. To produce nuclear warheads for

416 There has been speculation that an ambiguous signal detected on September 22. 1979, by a U.S. satellite overflying the South Atlantic may have been the flash from a nuclear test, and if the event was indeed a test that it was conducted by Israel or South Africa. Uncertainties about the event have never been resolved.

417 Iraq's effort to develop these elements of nuclear weapons is known to have suffered considerable setbacks and had not succeeded prior to the 1991 Gulf War, despite several years of effort.

ballistic missiles, however, additional steps are necessary, such as the development of re-entry vehicles, the miniaturization and/or reconfiguration of nuclear weapons to fit into missile nose cones, and certifying the weapons to withstand the rigors of blast-off, extremely high altitudes, and re-entry.

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