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A Short History of Nuclear Non-Proliferation

by Ben Sanders*

Introduction: Prehistory

The following is a rough sketch of the nuclear non-proliferation regime, the set of measures put in place to deter the spread of nuclear weapons. It aims to give a brief description of events that shaped the regime, and to indicate the rationale for its major components. It was originally written to assist participants in the Advanced Training Seminar on the "Rules governing International Transfers of Nuclear and Nuclear-related Material, Equipment and Technology, and the Transport of Radioactive Materials" in seeing more clearly how rules governing international transfers of nuclear and nuclear-related material, equipment and technology, and the transport of radioactive materials, function as elements of the regime. As was seen at the Advanced Training Seminar, those rules themselves are part of that picture, and as such, are basic components of the nuclear non-proliferation regime.[1]

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* Mr. Sanders is the Executive Chairman of the Programme for Promoting Nuclear Non-Proliferation. This article is the exclusive responsibility of its author and does not necessarily reflect the views of his Organisation, the Programme for Promoting Nuclear Non-Proliferation, or of any member of its Core Group. This article was prepared for the EC/IAEA/NEA Advanced Training Seminar on the Rules governing International Transfers of Nuclear and Nuclear-Related Material, Equipment and Technology, and the Transport of Radioactive Materials, held at Tallinn, Estonia, on 24-28 August 1998. Nevertheless, the views expressed herein do not necessarily reflect the views of any of those sponsoring Organisations.

1. The unsuspecting reader should be warned at the outset that the term 'regime' is used here – as in many other publications on the subject of nuclear non-proliferation – in a rather misleading manner, and for want of a better term. Generally, 'regime' denotes an orderly system of measures that regulate a particular action or actions or a well-defined situation. The term also implies that those measures are promulgated by an accepted authority and are enforceable. None of this directly applies to the nuclear non-proliferation "regime". It is neither "orderly", in the sense of consisting of building blocks that fit snugly together according to a well thought-out scheme, nor is it a "system", in the sense of having been planned in a deliberate order. Most of the measures have been adopted, one by one, as the need for them became obvious or the opportunity for their adoption opened up, by groups of states whose composition varied from measure to measure. There is no single authority that has adopted or sanctioned all measures involved, nor are most of them readily enforceable. The main reason why, nevertheless, we call this kaleidoscope of measures a "regime" is to imply that the various components should

Concern about the risk of nuclear war breaking out has existed since the beginning of the nuclear era, more than half a century ago. That concern has grown with the fear that the ability to manufacture nuclear weapons would spread to ever more countries. This paper gives a brief overview of the steps that have been taken to stem that spread.

At the end of World War II only one country possessed nuclear weapons: the United States of America. The USA realised from the outset that it could not maintain this monopoly forever and its closest allies, Great Britain and Canada, which had co-operated in the development of the atomic bomb, shared the wish not only to prevent the spread of these frightful weapons, but to make available to the world the information needed for the development of atomic energy. In an Agreed Declaration on Atomic Energy, of 15 November 1945, the President of the USA and the Prime Ministers of Great Britain and Canada stated that they were prepared to share "on a reciprocal basis with others of the United Nations" information on the practical industrial application of atomic energy "just as soon as effective enforceable safeguards against its use for destructive purposes [could] be devised". The Declaration called for the establishment within the United Nations of a Commission among whose tasks would be to "control atomic energy to the extent necessary to ensure its use only for peaceful purposes", to make specific proposals "for the elimination from national armaments of atomic weapons..." and for "effective safeguards by way of inspection and other means, to protect complying states against the hazards of violations and evasions".[2]

The issue was discussed with the Soviet Union in Moscow and as a result, on 27 December 1945, the now four nations issued a joint communiqué which called for a United Nations Atomic Energy Commission that should be established by the General Assembly and should report to the Security Council. At its first session, the General Assembly, on 24 January 1946, unanimously adopted a resolution to this effect – its very first resolution.[3] Like the Agreed Declaration, the Assembly's resolution dealt simultaneously with the questions of peaceful uses of atomic energy, its control, the elimination of nuclear weapons and the verification of compliance. It would be the task of the new Commission to make specific proposals in all these areas.

The Baruch Plan

The UN Atomic Energy Commission (UNAEC) met for the first time in June 1946. On that occasion the US Representative, Bernard Baruch, proposed the creation of an International Atomic

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be seen as subordinated into a single structure erected against nuclear proliferation, however incomplete and ramshackle it may be. The term reflects, in fact, an optimistic view of what, in the long run, should come to be a world-wide, watertight barrier against nuclear proliferation.

2. See Paul C. Szasz, *The Law and Practices of the International Atomic Energy Agency*, Legal Series No. 7, IAEA, Vienna, 1970, pages 11 and 12. The fact that it was felt necessary to seek the means of charging a special body with activities one might have assumed the United Nations to undertake as a matter of course is due to the circumstance that the UN Charter preceded by several months the disclosure that nuclear weapons existed so that it was obviously impossible for the drafters to take them into account. It is fair to speculate that, had these dates been reversed and had it been possible to write the Charter in the awareness of the existence of nuclear weapons, the drafters would surely have sought to include provisions for ways in which the United Nations should deal with the threat to international peace and security of nuclear proliferation. It is also fair to assume that one element of the Charter; i.e. the veto power of the permanent members of the Security Council, would have been dealt with differently.

3. The history of the UN Atomic Energy Commission is set out at some length in a United Nations publication, '*The United Nations and Disarmament 1945-1970'*, UN sales no. 70.IX.1, pages 11-24.

Development Authority (IADA), which would be entrusted with all phases of the development and uses of atomic energy. IADA would have among its tasks to:

(i) develop a thorough control system;

(ii) obtain, through surveys and by other means, complete and accurate information on the world supplies of uranium and thorium, which would then be brought under its domination;

(iii) exercise complete managerial control over any production of fissionable materials and to own and control all such material;

(iv) be vested with the exclusive right to conduct research on atomic explosives;

(v) distribute throughout the world the activities and stockpiles entrusted to it;

(vi) promote the peaceful uses of atomic energy;

(vii) have full freedom of access, through its representatives, to all intrinsically dangerous activities (as these might be defined from time to time) – though, due to its complete operating control over these, its inspection functions could be limited to detecting clandestine atomic operations and to checking on the less dangerous activities that might be conducted under its license;

(viii) recruit its personnel on the basis of proven competence but also, so far as possible, internationally.

As the summary referred to in the second endnote to this paper put it, "The Authority was to conduct continuous surveys of supplies of uranium and thorium and bring the raw materials under its control. It was to possess the exclusive rights both to conduct research in the field of atomic explosives and to produce and own fissionable material. All other nuclear activities were to be permitted only under license of the Authority, which would lease, under safeguards, denatured fissionable materials. Dangerous activities of the Authority and its stockpiles were to be decentralised and strategically distributed. All nations were to grant the freedom of inspection deemed necessary by the Authority. Mr. Baruch stressed the importance of immediate punishment for infringements of the rights of the Authority and maintained that: "There must be no veto to protect those who violate their solemn agreements not to develop or use atomic energy for destructive purposes." In the terms of the Plan, once a system of control and sanctions was effectively operating, further production of atomic weapons would cease, existing stocks would be destroyed and all technological information would be communicated to the Authority."

It is important for the purpose of this paper to stress that the Baruch Plan used the term 'safeguards' as consisting of more than mere verification ("inspection and other means") and as necessarily requiring adequate physical control. Both the Baruch Plan and the above-mentioned UN resolution reflected the conviction that safeguards are needed to prevent the proliferation of the military use of atomic energy. Although these documents contain an element of disarmament – the UN resolution speaks of the "elimination from national armament of atomic weapons" – international safeguards were not seen primarily as a disarmament measure but were in the first place intended as an assurance against nuclear armament by those states which did not yet have the capability of manufacturing atomic

weapons. Thus, long before the concept of "proliferation" was formulated, non-proliferation was thought of as a corollary to the inevitable, if obviously not always desirable, spread of nuclear knowledge and capability. In other words, the main purpose was "peaceful promotion without military proliferation".[4]

The Baruch Plan and a number of counterproposals were the subject of long and heated debate, first in the UNAEC and subsequently in the Security Council and in the General Assembly of the United Nations. In 1949 the USSR detonated its first nuclear device and in 1952 the United Kingdom did the same. Meanwhile the US had produced a modest stockpile of nuclear material for military purposes. Obviously, the grandiose scheme of establishing an international authority that would control all nuclear materials was no longer viable. Thus died the first attempt at non-proliferation through international ownership and control. In further attempts the disarmament aspect would be secondary or lacking altogether, but the non-proliferation idea would live on. It would be reflected in a multitude of measures of which the most important are mentioned in this paper.

Atoms for Peace

The first practical step to a multinational non-proliferation regime was again taken in the UN General Assembly, in the form of a proposal called the "Atoms for Peace Plan", advanced by US President Dwight D. Eisenhower in 1953. The Atoms for Peace Plan was based on the idea that it would be possible to promote the peaceful uses of atomic energy, as well as nuclear disarmament, by transferring fissionable material from military to civilian uses. The Plan foresaw the creation of an international atomic energy agency that would dispose of a stock of nuclear material hitherto earmarked for military purposes, which was to be used exclusively for peaceful ends. While not expressly mentioning the concept of safeguards, the Eisenhower Plan clearly implied their pre-eminent role and reflected the assumption that as peaceful uses increased, international verification would spread its web over the world and reduce the danger of nuclear-capable nations proliferating.

The International Atomic Energy Agency

The Statute of the International Atomic Energy Agency (IAEA) was opened for signature on 20 October 1956 and its safeguards provisions became the basis for the nuclear verification and monitoring activities that have been applied in the forty years that followed. Article II of the Statute requires the Agency to "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 as way as to further any military purpose". Article III A.5 authorises the Agency to establish and administer safeguards in three categories of cases: (a) in connection with the assistance provided by the Agency or at its request, under its supervision or control; (b) at the request of the parties to any bilateral or multilateral arrangement; and (c) at the request of a state, to any nuclear activity of that state. Article XI F.4 provides that any project of the Agency for research on or development or practical application of atomic energy must include undertakings by the states involved that the assistance provided shall not be used in such a way as to further any military purposes and that the project shall be subject to safeguards.

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4. For a fuller description of this philosophy, see Benjamin Sanders, *Safeguards Against Nuclear Proliferation*, A SIPRI Monograph, MIT Press, 1975, 114 pp.

IAEA Safeguards

The Agency's Statute itself does not contain any obligation for a state to submit to Agency safeguards, except where it is a beneficiary of an Agency project. In the other two categories of cases listed in Article III, the reason for accepting safeguards may be either the fact that the state concerned is a party to a legal instrument obliging it to accept such safeguards or has other reasons for doing so - most usually because it is the recipient of nuclear material or equipment and the state supplying this has made it a condition that Agency safeguards should be applied in connection with such items. On such occasions, especially in the past, the obligation to submit to safeguards would be contained in a bilateral agreement for the provision of nuclear material or installations, of which many have been concluded by the United States, the United Kingdom and Canada, that provided for the transfer to the IAEA of the safeguards function. Much more often now, the obligation follows from a multilateral agreement such as the Treaty for the Prohibition of Nuclear Weapons in Latin America (the Treaty of Tlatelolco of 1967)[5] or the Non-Proliferation Treaty (NPT), which oblige parties to accept IAEA safeguards on all their nuclear activities; agreements to that effect are usually referred to nowadays as full-scope or comprehensive safeguards agreements. The IAEA Statute enables the Agency to accept safeguards responsibility in these various cases, but this is not in itself sufficient: the Agency can only carry out safeguards on the basis of a specific agreement with the state or states concerned.

It is not the intention here to go into detail about these agreements or about the IAEA's safeguards systems that have come about in the years since the organisation was established. This occurred, at least initially, in a rather haphazard fashion. In 1958, the IAEA was instrumental in the provision of Canadian natural uranium for a research reactor in Japan. This made it necessary for the Agency to agree with Japan on safeguards measures, even before the Agency had had the opportunity to elaborate such measures in a systematic way. There were several reasons why it was considered necessary to devise a generally applicable system. In the first place, the Agency could not discriminate among states in the way it would apply its safeguards and therefore needed a single system that could be applied everywhere. Secondly, countries had to know what to expect and the IAEA's safeguards personnel had to know in advance how they would have to apply safeguards. Thirdly, the Agency's Board of Governors, which has the statutory function of approving agreements concluded by the Agency, including, obviously, agreements for the application of safeguards, and which determines the action to be taken in the case of non-compliance, was clearly interested in the standardisation of such agreements. Thus came about the identification of the safeguards system with the agreements the Agency was to conclude for the application of safeguards.

The earliest safeguards system[6] stated somewhat vaguely that it consisted of "principles and procedures established for the information and appropriate guidance of Member States as well as for the guidance of the Board itself in the administration of safeguards by the Agency". This was subsequently extended in scope. A system of wider scope was approved by the Board in 1965.[7] This stated expressly that it was "... for the information of Member States, to enable them to determine in advance the

5. The name of the Treaty was subsequently changed to include also the Caribbean.

6. IAEA Document INFCIRC/26 of 1961, which related only to reactors of less than 100 MW(th). This first "Safeguards Document" foresaw that provisions covering other types of nuclear facilities would be developed as the need for them arose.

7. IAEA Document INFCIRC/66. This was extended in 1966 and 1968 and is still in force as INFCIRC/66/Rev.2. Since the "INFCIRC/66 system", as it has come to be known, applies to individual nuclear activities, it is employed in states that are not parties to the NPT or to any other instrument, such as a Nuclear-Weapon-Free Zone that would require them to conclude a so-called comprehensive safeguards agreement.

circumstances and manner in which the Agency would administer safeguards, and for the guidance of the organs of the Agency itself, to enable the Board and the Director General to determine readily what provisions should be included in agreements relating to safeguards and how to interpret such provisions" and it said that its provisions would become binding when and to the extent they were incorporated in an agreement with the state concerned.

Safeguards under the NPT

In July 1968, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) was opened for signature. Studies made in the IAEA in preparation for its role under the Treaty found that a new safeguards system would be called for to apply, pursuant to the Treaty, to a country's entire range of peaceful uses of nuclear energy. After the NPT entered into force, on 5 March 1970, the Agency's Board of Governors established an open-ended committee "to advise it on the Agency's safeguards responsibilities in connection with the NPT and on the content of the agreements which would be required in connection with that Treaty". The committee's report was completed in March of 1971, as a set of recommendations for the contents of safeguards agreements; it was in fact a complete safeguards system designed to enable the Agency to apply safeguards pursuant to the Treaty. On 20 April 1971, the Board authorised the Director General to use it as the basis for the agreements required by the NPT. Ever since it has set the terms for the application of safeguards under the Treaty.[8] Later, a variety of circumstances, not entirely unforeseen even at the time the system was adopted, foremost among them the realisation after the war in the Persian Gulf that Iraq, a party to the NPT, had been engaged in an ambitious nuclear-weapons programme carried out entirely outside the IAEA's safeguards, made it necessary for the safeguards system to be extended in scope and methods. On 15 May 1997, the Board approved a model protocol to the standard safeguards agreements, designed to reinforce the effectiveness and efficiency of Agency safeguards. The provisions of this protocol take effect as and when they are accepted by states.[9]

Around the time the IAEA started to develop its first safeguards system, several newly established regional organisations did the same. Almost simultaneously, six western European states adopted the Treaty of Rome, establishing EURATOM as the nuclear branch of the European Economic Community, and the (then) Organisation for European Economic Co-operation (OEEC) established the European Nuclear Energy Agency, or ENEA. Both bodies set up their own administrative regulations, including safeguards systems. The various negotiations took place independently, but subsequently formal relationships were established between the respective bodies and the IAEA, notably in connection with safeguards. It may be less generally remembered that the Organisation of American States (OAS) created an Inter-American Nuclear Energy Commission (IANEC) which, somewhat like the ENEA, had the task of promoting the development of peaceful uses of nuclear energy in the southern part of the western hemisphere; like its European counterpart, it was authorised to establish joint projects. Its activity, however, fell victim to an apparent lack of interest among its member states and the dwindling importance of the OAS.

The efforts so far referred to all had in common an element of promotion and an element of prevention, based as they were on the premise that underlay every related measure since the Baruch

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8. For a thorough survey of the evolution of the safeguards system up to 1985, see David Fischer and Paul Szasz; Jozeph Goldblat, Editor, *Safeguarding the Atom: A Critical Appraisal*, SIPRI, Taylor & Francis, London and Philadelphia, 1985, 243 pp.

9. IAEA Document INFCIRC/540.

Plan, that the world should profit from the peaceful uses of nuclear energy and that there should be barriers to the use of nuclear energy for the development of weapons. As we have seen in the brief reference to the early efforts and as one can see amply illustrated in the literature about, particularly, the efforts of the United States to combine the export of nuclear facilities, equipment, material and technology with measures to prevent their misuse, the fear of proliferation was ever present but not always fully recognised.

Peaceful Uses and the NPT

No international instrument reflects this dichotomy more clearly than the NPT. In that Treaty non-nuclear-weapons States parties undertake not to manufacture or otherwise acquire nuclear weapons[10]. That might be seen as the "negative" side of adherence to the NPT: the principal undertaking "not to". In "positive" terms, Article IV of the Treaty confirms "the inalienable right of all the parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination". Article IV goes on to say that all the parties to the Treaty "have the right to participate in... the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy".

There is little or no literature to document in so many words the philosophy that combined an injunction "not to" with the promise "thou shalt have". There is an obvious problem with a promise to supply technology, equipment and material for peaceful uses which also lend themselves for the production of nuclear weapons. At the time, however, the international community felt that this conundrum had been resolved through parties' submission to international verification, which would demonstrate their good faith. The doubts seem to have come only afterwards, and then in particular from a small number of nuclear exporters who were in a position to profit from a well-established position in the global nuclear market.

I represented the IAEA at a month-long Conference of Non-Nuclear-Weapon States that was held in the summer of 1968 in Geneva, after the General Assembly had approved the text of the NPT. One of my main occupations at that Conference was assuring delegates that safeguards – which were widely suspected as a serious impediment to the free application of nuclear energy – would not stand in the way of legitimate uses and would in fact be helpful in promoting international trade and co-operation in the field. The Conference had lengthy discussions on that issue. Its final declaration included the view that "... possibilities for the peaceful use of nuclear energy have increased, which is of particular importance for the economic development of non-nuclear-weapon countries and for an accelerated development of the developing countries. It is imperative to ensure conditions which would promote the peaceful uses of nuclear energy, encourage international co-operation in this area, ensure unhampered flow of nuclear materials under appropriate and effective international safeguards, as well as

10. Pursuant to Article IX, paragraph 3 of the Treaty, a nuclear-weapon State is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967. As we saw before, the US did so in 1945, the USSR in 1949, and the UK in 1952. Subsequently, France staged its first nuclear explosion in 1962 and China in 1964. Accordingly, these five states for the purposes of the Treaty, are the only nuclear-weapon States; all other states are, by exclusion, non-nuclear-weapon States. India tested for the first time in 1974, and Pakistan did so in 1998. In terms of the NPT, these two states cannot be considered nuclear-weapon States and unless the Treaty is amended, which is unlikely, they can only accede to it as non-nuclear-weapon States, which means that they have to submit to international safeguards "with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons ..." or, in other words, they would have to give up their nuclear weapons.

information, scientific knowledge and advanced nuclear technology exclusively for peaceful purposes on a non-discriminatory basis." At the conference, I was able to note repeatedly the basic assumption obviously held by the majority of delegations that once parties had accepted IAEA safeguards, nothing would stand in the way of their unhampered access to the blessings of the peaceful uses of nuclear energy. That safeguards might eventually be deemed to be an insufficient guarantee certainly does not seem to have played any part in the proceedings and if it occurred to any of the suppliers, they did not alert prospective customers to this fact.

The Issue of Nuclear Trade

International trade in nuclear technology, equipment and materials is fundamental to the peaceful uses of nuclear energy. Article III, 2 of the NPT sets the basic conditions for such trade in requiring each State Party to undertake:

> "not to provide: (a) source or special fissionable material, or (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 subjected to the safeguards required by this Article."

This is a crucial part of the Treaty. It not only requires a state to refrain from using its nuclear material for proscribed purposes and to accept safeguards to verify its compliance, but it also requires that nuclear material is not exported without safeguards being applied at its destination and that material and equipment suitable to be used for nuclear purposes should only be sold abroad on condition that the nuclear activity for which they are intended will in turn be covered by safeguards.

The adoption of this Article represented the first instance of general agreement among suppliers to make the export of certain nuclear items conditional on safeguards at the receiving end. This had not been the case before. There had been several cases of exporter states managing to make a deal at least in part because they did not require the application of safeguards in the recipient country. There was an obvious danger that safeguards might become hostage to commercial competition.[11] At this point, however, the first thing to be done was to agree on the items to which export controls would have to be applied and to define in detail the meaning of the phrase "*equipment or material especially designed or prepared for the processing, use or production of special fissionable material*". This was important because if a particular component was seen to fall under that definition, it would "trigger" safeguards at the installation where it was used, even if all the rest of that installation was built indigenously.

The Zangger Committee

In the early 1970s, a committee was set up of most of the principal nuclear supplier countries, under the chairmanship of Professor Claude Zangger, for the purpose of reaching a common

11. An early illustration of this situation may be read in the statement by the German delegate at the 1966 General Conference of the IAEA, which expressed the readiness of the (then) Federal Republic of Germany to include in its contracts for the supply of nuclear materials and equipment to countries outside the area of the European communities a clause requiring safeguards to be applied by the Agency, *provided other supplying countries were willing to impose the same condition*. See Sanders, *op.cit.*, pages 16-21.

understanding on the interpretation and implementation of Article III, 2, with a view to establishing conditions for fair commercial competition in this respect. An important task of the Committee was to draw up a list of materials, equipment and components that would trigger the application of safeguards. A first version of the "Trigger List" was completed in August 1974. It has since been under almost continuous review and the "Zangger Committee" has gone on to play an important role in the nuclear export regime. One item that was not covered in the initial list was the provision of know-how; nor did that list initially deal with dual-use items. This matter was developed in much detail at the Advanced Training Seminar.

It should be noted that since the NPT expects its non-nuclear-weapon parties to submit to IAEA safeguards the source or special fissionable material in all its peaceful nuclear activities, Article III, 2, as interpreted by the Trigger List, is applicable in principle only to non-parties to the Treaty.

Concerns and Initiatives

Meanwhile, concern arose that international safeguards might not by themselves be sufficient to prevent states from realising prohibited nuclear ambitions. Several developments occurred to feed this concern. Argentina and Brazil – neither of them party to the NPT – were seen to develop a rivalry which in the eyes of expert observers had all the makings of an incipient nuclear arms race. At the same time, Germany was contemplating the export to Brazil of a complete nuclear fuel cycle (this is described in greater detail in endnote number 14). Pakistan, another non-party, had made an agreement with France for the supply of a reprocessing plant. Combined with its natural-uranium power reactor at Karachi, this might have put it in the way of starting a nuclear-weapons programme.[12] The Republic of Korea was also preparing to construct a reprocessing plant. Taiwan was thought to have plans in that respect as well, and there were clear indications that Israel was embarked on an ambitious nuclear weapon programme. In 1974 India staged what it called a "peaceful nuclear explosion". American pressure succeeded in having the deals with Pakistan and South Korea cancelled, and its influence in Taiwan was great enough to reverse developments there. The Brazil/Germany deal, however, was consummated, albeit under IAEA safeguards.

All these events led to a growing international preoccupation with the danger of nuclear proliferation and to the overt recognition that international safeguards by themselves would be unable to stem this tide. Moves to meet this concern took two forms. One was an attempt to find a less "proliferation-prone" fuel cycle, in which the presence of highly-enriched uranium and plutonium – the essential ingredients of nuclear weapons – could be avoided and in particular, no use would be made of the option of "breeding" plutonium as a fuel for a future generation of reactors. To this end, in 1977, US President Carter took the initiative of launching the International Fuel Cycle Evaluation (INFCE), in the hope of identifying a fuel cycle in which the use of the so-called 'sensitive' technologies, facilities and materials could be avoided. This attempt to find a "technical fix" for an insoluble physical problem did not succeed, notwithstanding several years of intensive research and deliberations, and the production of thousands of pages of reports, bound in eight fat volumes. The single most important

12. In fact, Pakistan acquired its weapon-capability principally along the uranium enrichment route. Its first steps in that direction were based on ultra-centrifuge blueprints purloined in the Netherlands. Parts and materials for the installation are said to have been maintained bit by bit in a variety of other western countries. Only a few weeks ago, a German national was convicted in his own country for the clandestine supply to Pakistan of parts for a centrifuge to enrich uranium.

conclusion from the report might have been the sentence that "No single judgement can be made about the risks of diversion from different fuel cycles that is valid both now and in the future."[13]

In practice since the late 1970s, the interest in what has become known as the "Plutonium Economy" has decreased, as the demand for nuclear energy lessened. It is difficult to predict at this stage if current developments, in particular a greater awareness of the ecological advantages of nuclear energy over the use of fossil fuel, will bring greater use of nuclear energy. It is doubtful, however, that this would have much impact on the proliferation concern and the way to deal with it. Events in the Democratic People's Republic of Korea (DPRK) and Iraq have shown that states determined to embark on a nuclear weapons programme, notwithstanding the fact that they are parties to the NPT, are likely to have recourse to the use of facilities that are not part of the declared fuel cycle at which IAEA safeguards are applied. Those facilities would either be used exclusively, or almost exclusively, for the production of weapons-grade material or they would be specifically constructed for that purpose. In a way, therefore, the INFCE effort has turned out not to be fully relevant.[14]

Export Controls

The other way of avoiding that international nuclear trade would increase the risk of proliferation was by adopting a policy of not exporting items that might help recipients manufacture nuclear weapons; in other words, a policy of denial. As pointed out before, this was not a simple proposition: unless all potential suppliers of a given item could agree to the export policy to be followed in regard to that item, i.e. whether or not and under what conditions they should supply such items, the country that set the least stringent conditions would have the competitive advantage. In 1974, Canada, the Federal Republic of Germany, France, Japan, the Soviet Union, the United Kingdom and the United States met in London to discuss further restrictions on their nuclear exports. France had in the past been criticised for exporting items that were seen as apt to add to the recipients' ability to run a nuclear weapons programme; examples: the reprocessing plants of Pakistan and the Republic of Korea, referred to above. The essential differences between the work of what became known as the "Nuclear Suppliers Group" (NSG) and that of the Zangger Committee (all initial NSG members except France were members of the Zangger Committee) is that, beside the fact that they applied also to NPT parties, the Guidelines drawn up by the NSG listed, among other things, items in regard to which exporters should "exercise restraint" – that is, the export of such items was to be discouraged. Furthermore, supplier nations could set certain conditions, including the requirement that their consent would have to be obtained before uranium enrichment equipment would be used to achieve an enrichment level above 20

13. For an excellent brief summary of the rationale for INFCE, see Fischer and Szasz, *op. cit.*, pages 104-105.

14. The relative irrelevance of the assumption that it might be possible, and would in any case be desirable, to avoid a "proliferation-prone fuel cycle" was illustrated in the case of Brazil. In the mid-1970s, Brazil approached the (then) Federal Republic of Germany for the supply of a complete nuclear fuel cycle connected with the use of pressurised-water reactors, using low-enriched uranium. The deal would include all necessary facilities: a uranium-processing plant, an enrichment facility, a fuel fabrication facility, power reactors, and a spent fuel reprocessing plant. At that time, Brazil was not a party to the NPT nor to any other instrument, such as the Treaty of Tlatelolco, that would oblige it to put all its nuclear installations under IAEA safeguards. Germany, however, undertook to ensure that all installations to be constructed pursuant to its agreement with Brazil would be submitted to IAEA safeguards. However, this left Brazil free to construct other facilities without submitting those to safeguards. Brazil purchased only part of the items covered by its deal with Germany. At the same time it developed what became known as a "parallel programme" which was not under safeguards and which was intended for military purposes, both the development of propulsion units for the navy and, presumably, the production of nuclear material for explosive purposes. This effort was stopped in the 1990s and Brazil has since joined both the Tlatelolco Treaty and the NPT.

per cent; the requirement that they would have to give their consent before material supplied or obtained from supplied facilities was reprocessed; and before certain "sensitive" items were re-exported. For the first time, the Guidelines also required that physical protection would have to be provided for all items on the Trigger List.

The membership of the NSG has since grown to almost 30. Most recently it has dealt with the issues of guidelines governing the export of dual-use materials and technology; i.e. items defined as having "*legitimate non-nuclear uses, but [which] if diverted, could make a major contribution to nuclear explosive and unsafeguarded nuclear-fuel cycle activities*". Under the Guidelines, such items may only be transferred to a non-nuclear-weapon state if they are accompanied by IAEA or equivalent (e.g. EURATOM) safeguards. Here also, the suppliers' veto over retransfers applies.

Ever since the NSG was created, the fact of its existence has been the object of severe criticism on the part, especially, of developing countries, which maintain that the restrictions practised by what is often pejoratively called the "Suppliers' Club" run counter to the letter and the spirit of the NPT. To recall: Article IV of the Treaty confirms the "*inalienable right of all the Parties to the Treaty to [benefit from the] use of nuclear energy for peaceful purposes without discrimination*". Supplier states, on the other hand, note that the pertinent provision of Article IV ends with the phrase "*... in conformity with Articles I and II of this Treaty*": the Articles of this Treaty, which forbid nuclear-weapon states to help non-nuclear-weapon states obtain or produce nuclear weapons, respectively contain the obligation for non-nuclear-weapon states to refrain from obtaining or producing nuclear weapons. Suppliers accordingly maintain that it is part of their basic obligations under the Treaty not to supply anyone with the means to make nuclear weapons.[15]

Developing states have expressed this criticism most clearly in the framework of the United Nations, and in the five-yearly Review Conferences of the NPT. Those conferences, which serve the purpose of "*..[reviewing] the operation of the Treaty with a view to assuring that [its] purposes are realised*",[16] are the obvious forum for a discussion between those states parties that emphasise the primacy of the 'inalienable right' confirmed in Article IV, of obtaining any facility, material or technology that would serve their nuclear programme and those who stress that a watertight non-proliferation regime requires the imposition of certain unavoidable restrictions. The issue is a traditional subject of profound disagreement, fuelled by the fear of developing nations that industrial states may use their supposed preoccupations about nuclear proliferation to deprive potential competitors of the means to develop their own nuclear industries, and also to discriminate among recipient states.[17] There have been attempts to bridge the gap, but this has proven to be difficult.

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15. For a good, brief exposé on the rationale of nuclear export controls, see the Editor's Preface in Harald Müller, Editor, *Nuclear Export Controls in Europe*, European University Press, Brussels, 1995; 275 pp.

16. NPT, Article VIII, 3. Review Conferences have been held every five years since 1975. The Review Conference of 1995, 25 years after the entry into force of the Treaty, was combined with the 'extension conference' foreseen to be held that year in accordance with Article X, 2. That conference decided that the Treaty should continue in force indefinitely. The next Review Conference is due in the year 2000.

17. A case in point is the situation of Iran (Islamic Republic of) as against that of the DPRK. In the 1970s, German firms were in the process of constructing a two-unit nuclear power station near Bushehr on the shore of the Persian Gulf. With the advent of the Iranian revolution work stopped and during the Iran/Iraq war of the early 1980s, a partially completed structure was damaged by aerial bombardment. Since then, several western countries, in particular the USA, have expressed the suspicion that Iran is engaged in a nuclear weapons programme and have called for a stop to any nuclear exports to that country. The Russian Federation has made a deal with Iran to complete the power station and the US is involved in an ongoing campaign to dissuade Moscow to go through with this plan. On the other hand in the early 1990s, the DPRK, like Iran a party to the NPT and subject to full-scope IAEA safeguards, was suspected of producing plutonium for weapons purposes in

Suggestions for some form of involvement of actual or potential recipient states in the deliberations of the NSG have not so far been met, and it is too early to say whether and in what form they might eventually be realised. However, the NSG are taking steps to give greater transparency to their work. As a first step, a working group on transparency has been created, which in October of last year, held a seminar in Vienna to explain the NSG's activities and receive views from delegations of states that do not belong to the NSG. At a subsequent session of the Preparatory Committee for the NPT review conference of 2000, however, this effort did not seem to have struck the critics of the NSG as particularly convincing by itself, although the fact that suppliers and recipients had been able to discuss their differences seemed to have been appreciated as representing some progress. The matter remains a potential source of conflict, however, capable of weakening the non-proliferation regime, and the two sides need to continue efforts to find some form of accommodation.

Supporting Measures: The Security Council

Reverting to what might be called the category of basic measures that underpin the non-proliferation regime, mention should be made here especially of various declarations which reflect the intentions of states with regard to the regime. As indicated in endnote number 2 to this paper, taking the text of the Charter literally, this would appear not to present an immediate legal or political basis for any UN activities in the area of non-proliferation, and could not be seen as the basis for the global non-proliferation regime. In the aftermath of the discovery of Iraq's clandestine efforts to produce a range of weapons of mass destruction and the means to deliver them, the UN Security Council, on 31 January 1992, took the unprecedented step of interpreting the Charter through a statement of its President, which, to all intents and purposes, said that it was one of the tasks of the Security Council to deal with the proliferation of all weapons of mass destruction. In the President's declaration, the Council pronounced proliferation to constitute a threat to international peace and security, the area of Chapter VII of the Charter, where the Council has its pre-eminent responsibility. In addition, according to the Declaration, the members of the Council "*... commit [ed] themselves to working to prevent the spread of technology related to the research for or production of such weapons and to take appropriate action to that end*".[18] The Declaration, further, refers to the NPT and emphasises "*the integral role in the implementation of that Treaty of fully effective IAEA safeguards, as well as the importance of effective export controls*". In so doing, the Security Council's Declaration obviously, if to some extent retroactively, legitimises non-proliferation measures such as those contained in the NSG Guidelines.

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a research reactor that was under safeguards and of being in the midst of constructing several large plutonium-producing reactors. Trying to have this ambitious programme stopped, the USA made a deal with the DPRK (known as the 'Agreed Framework') under which, among other things, the USA, Japan and South Korea will construct in the North two large power reactors and, pending the start of operations, supply the North with the heavy fuel oil it needs to meet its energy requirements. Meanwhile, the DPRK has undertaken to freeze its own nuclear programme and to allow a limited measure of IAEA safeguards (which, when it was confronted with its clandestine nuclear activities, it had rejected altogether). The juxtaposition of a country that is suspected of being interested in the development of nuclear weapons being denied nuclear supplies as against a country that is found out in a clandestine activity and is, as some see it, rewarded with nuclear supplies, is obviously anomalous. For details about the nuclear situations in the two countries, see Rodney W. Jones and Mark G. McDonough, with Toby Dalton and Gregory Koblentz, *Tracking Nuclear Proliferation: A Guide in Maps and Charts, 1998*, Carnegie Endowment for International Peace, Distributed by Brookings Institution Press, pages 147-160 and 169-186.

18. UN Document S/PV.3046.

Questions of Enforcement

The Declaration of the Council's President also contains the statement that *"The members of the Council will take appropriate measures in the case of any violations notified to them by the IAEA.*" This raises the difficult issue of enforcement; i.e. the question of what international organisations can do if it is determined that states are in non-compliance with treaty undertakings. The IAEA's Statute says that if inspectors find any non-compliance they must report this to the Agency's Director General, who shall transmit that report to the Board of Governors. The Board in turn must call on the state or states concerned to "*remedy forthwith any non-compliance which it finds to have occurred*" and it also must report this to all member states, to the Security Council and to the UN General Assembly. If the state does not "*take fully corrective action within a reasonable time*", the Board may curtail or suspend assistance given by the Agency to the state (which of course only applies if the safeguards violated pertain to items provided by the Agency) or it may suspend the state from the exercise of the privileges and rights of membership.

This is clearly not a very impressive remedy, although in some cases the fear of the publicity which the Board is supposed to give to the infringement may operate as a deterrent. More important is the authority of the Security Council in such a case – laid down in the IAEA's Statute, as we have seen, but since the Declaration of 1992 recognised to be implicit in the Charter. In the case of Iraq the Council has shown that if it is of one mind it can impose far-reaching sanctions. Even where it does not do so, as in the case of the DPRK, an unambiguous reprimand from the Council can give a state or group of states political support for action towards a solution. The problem, as always, is in the way the Security Council decisions are adopted: those need not only a majority of the members, but among them all five permanent members must concur. These days, we see that, in the case of Iraq, the United States and Great Britain are in favour of keeping the sanctions in full effect until Iraq has clearly shown that it has divested itself of all weapons of mass destruction and all the means to produce them. Russia and France, on the other hand, who have strong commercial interests in Iraq, want the sanctions lifted or at least softened. Even though, as this is being written, Iraq is adopting an uncooperative attitude towards any UN verification activities, there does not appear to be a consensus among the permanent members in favour of a forceful response. It is highly unlikely that there would be a consensus among the permanent members in favour of military action, should Iraq wish to profit from the situation by renewed non-co-operation. In the DPRK, one of the reasons why the USA had to resort to a policy of what might be described as bribery, was that China opposed an outright condemnation by the Security Council. Since this paper was originally drafted the DPRK also seems to have adopted a much more assertive attitude. In short, as usual in international affairs, except in the extremely rare case that the entire international community can agree on specific retaliatory action, it is extremely difficult to punish the violation of a Treaty obligation.[19]

Security Assurances

The issue of nuclear weapons is, in the first place, a matter of security: the security of the nuclear-weapon States, which think they need them, mainly for deterrence, and the security of the non-nuclear-weapon States, which wish to be spared from falling victim to their use. When the NPT was negotiated, over 30 years ago, the non-nuclear-weapon States sought to balance their renunciation of nuclear weapons against an undertaking from the nuclear-weapon States that they would reduce and eventually eliminate their nuclear arsenals. Meanwhile, until the nuclear playing field would be levelled,

19. See Fischer and Szasz, *op. cit.*, pages 135-152.

when all states would be "non-nuclear", and the probability of nuclear weapons being used would be reduced to practically zero, the non-nuclear-weapon States sought a means of preventing nuclear weapons from being used against them. They did so, in the first instance, by seeking binding assurances from the States with nuclear weapons that they would not use them against States that did not have such weapons. The non-nuclear-weapon States worked hard to get a provision of this kind incorporated into the NPT but they did not manage to persuade the others. Ever since, they have called for the adoption of a generally applicable international convention on security assurances. It goes without saying that if the non-nuclear-weapon States could be sure that nuclear-weapon-States would not use such weapons against them, they would find it easier to adhere to the regime that obliges them forever to abstain from acquiring nuclear weapons.

In June 1968, when the negotiations on the NPT were complete, the three depositary states of the Treaty, the USSR, the UK and the USA, expressed the intention that they would provide or support immediate assistance, in accordance with the Charter, to any non-nuclear-weapon State Party to the NPT "*that is a victim of an act or an object of a threat of aggression in which nuclear weapons are used*". The Security Council took note of this in its resolution 255 (1968), of which the preamble specifically referred to the concern of non-nuclear-weapon States Party to the NPT that in conjunction with their adherence to the Treaty, appropriate measures be undertaken to safeguard their security. A more extensive resolution to the same effect was adopted shortly before the opening of the 1995 NPT Review and Extension Conference; this time the undertaking, i.e. the security assurances, came from all five recognised nuclear-weapon States.[20]

The two resolutions contain "positive" security assurances, under which the nuclear-weapon States promise their help in the case of attack or threat of attack by nuclear weapons on non-nuclear-weapon States. As such, they are no doubt important elements of the regime. However, the world-wide legally binding assurance **not** to use nuclear weapons against non-nuclear-weapon States, which the majority of non-nuclear-weapon States have been seeking for so long, is still missing. This is seen by many as a serious shortcoming in the non-proliferation regime as it stands now, and it is a source of controversy at each Review Conference.

Nuclear-Weapon-Free Zones

Up to this point the paper has dealt with the global aspects of the non-proliferation regime. This also has some significant regional components. So far, four treaties have been concluded for the denuclearisation of specific inhabited regions: the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Treaty of Tlatelolco) of 1967; the South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga) of 1986; the African Nuclear-Weapon-Free Zone Treaty of 1996 (Treaty of Pelindaba); and the Treaty on the Southeast Asia Nuclear Weapon-Free Zone (Treaty of Bangkok) of 1995. There are also two treaties that ban nuclear activities in specific non-populated areas: the Antarctic Treaty of 1959, which prohibits all nuclear activities in that area, and the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, the so-called Outer Space Treaty of 1967, in which States Parties undertake "*not to place in orbit around the Earth any objects carrying nuclear weapons or any other kind of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner*".

20. See note number 10.

The nuclear-weapon-free zone arrangements have many elements in common: they all prohibit the manufacture and acquisition by their member states of nuclear weapons and the deployment of such weapons on their territories, and demand safeguards that are as a rule applied by the IAEA.[21] Several of them also include provisions regarding peaceful uses of nuclear energy. They also generally include protocols pursuant to which non-regional states that have geographical responsibilities in the region undertake to behave there as countries from the region and undertake not to use or threaten the use of nuclear weapons against the region.

This last-mentioned feature briefly brings us back to the issue of security assurances. All the agreements that provide for the establishment of non-nuclear-weapon zones also contain some form of annex or protocol under which nuclear-weapon states commit themselves not to use, or threaten the use of, nuclear weapons against the states of the zone. By thus associating themselves with the zonal arrangements, nuclear-weapon states in fact give the members of the zone a binding negative security assurance.[22] Nuclear-weapon-free zones are not only important building blocks in the non-proliferation regime, but they also serve as vital elements of their members' security.

The first of the series of present nuclear weapon-free zones,[23] the Tlatelolco Treaty, has become the model for all others. It is older than the NPT and is obliquely referred to in the latter Treaty's Article VII, which says that "*Nothing in this Treaty affects the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories*." The somewhat negative tone of the article reflects the doubt of western delegates to the NPT negotiations about the value of the Tlatelolco Treaty and the more general concern that the concept of nuclear-weapon-free zones was to some extent contrary to the (nuclear) first-use doctrine of the western nuclear-weapon states. The latter were disposed in particular against suggestions from members of the Warsaw Treaty Organisation for the establishment of nuclear-weapon-free zones in Central Europe and the Balkans, which the West considered incompatible with NATO's nuclear policies. Moreover, the United States navy was concerned that its freedom of movement on the high seas might be impeded by the constraints of an international treaty.[24] Nevertheless, over the years the concept of nuclear-weapon-free zones has gained considerable support and they are now also recognised by former opponents as potentially useful elements of the non-proliferation regime.

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21. In the framework of the Tlatelolco Treaty, Argentina and Brazil, which for long had avoided the acceptance of full-scope IAEA safeguards, have agreed on an interesting combination of bilateral inspection and verification that has been associated with the IAEA's safeguards system more or less along the lines of the arrangements made between the IAEA and Euratom for the application of safeguards in the latter's territory. A good description of the background of this arrangement can be found in a chapter "Factors in the Decisions by Argentina and Brazil to Accept the Non Proliferation Regime" by Dr. John R. Redick, in Barry R. Schneider and William L. Dowdy, *Pulling Back from the Nuclear Brink*, Frank Cass Publishers, London and Portland, Oregon, 1998, pages 67-79.

22. Not all nuclear-weapon States have yet adhered to every Protocol of every nuclear-weapon-free zone arrangement. In adhering, in some cases nuclear-weapon States customarily stipulate certain exceptions to their assurance.

23. A very informative series of articles about the Treaty can be found in *Disarmament, a periodic review by the United Nations*, Vol. XI, No. 1, Winter 1987-1988, pages 61-91. The author of the first article, the late Mexican Ambassador Alfonso Garcia Robles, is generally considered the father of the Treaty; he received the Nobel Prize for this achievement.

24. The book by David Fischer, *Towards 1995: The Prospects for Ending the Proliferation of Nuclear Weapons*, United Nations Institute for Disarmament Research (UNIDIR), Dartmouth Publishing Company, Aldershot, UK and Brookfield, USA, 1993, 292 pp., contains a chapter devoted to nuclear-weapon-free zones, which gives a good, short survey of the rationale for such zones and of proposals for additional ones.

In 1975, a comprehensive study of the nuclear-weapon-free zone concept was made by a study group working under the auspices of the Conference of the Committee on Disarmament (the forerunner of the present Disarmament Conference), in Geneva.[25] While this did not do much more than reiterate the principles reflected in the Tlatelolco Treaty, it contributed to keeping the positive trend alive. This is illustrated in the Final Document of the Tenth Special Session of the General Assembly, on disarmament, that was held in New York in the late spring of 1978. Paragraph 60 of the Final Document, repeating a conclusion reached in the study, states that "*The establishment of nuclear-weapon-free zones on the basis of arrangements freely arrived at among the States of the region concerned constitutes an important disarmament measure.*" In the three paragraphs that follow, the Final Document paraphrases the study in listing the modalities of creating such zones and refers to several areas where such zones either exist or might usefully be set up.

One of the areas referred to in the Final Document was the African region. At the time, it seemed doubtful that Africa could be denuclearised. South Africa was suspected of having nuclear ambitions (rightly, as it turned out) and there were also suggestions that Algeria, which was about to embark on a sizeable nuclear research programme, might have military plans in that area. Nevertheless, persistent efforts in the framework of the Organisation of African Unity and the United Nations resulted, within a little over a decade, in the development of a nuclear-weapon-free zone for Africa. Fundamental changes in South Africa's domestic policy in 1990 were followed by the disclosure in 1993 that it had manufactured seven nuclear devices, that it had dismantled them and that it would accede to the NPT as a non-nuclear-weapon State. To underpin the public recognition that its security would be best served by the demonstrated renunciation of the nuclear option, Pretoria gave the IAEA safeguards staff every possibility to verify that all nuclear material was present and accounted for.[26]

The decisive factor in the creation of the Tlatelolco Treaty was the Cuban missile crisis, when Latin and Central American countries came face to face with the real possibility that they might soon be in the middle of a nuclear missile exchange. The Rarotonga Treaty came about primarily because Pacific Islanders, mindful of the nuclear tests that earlier had made some of their territory uninhabitable and were still going on in Mururoa and Fangataufa, hoped to be able to banish all nuclear testing from their area; they also sought to prevent the dumping of nuclear waste in the region. The birth of the African zone was initially hastened by concern about South Africa and eventually facilitated by events in that country. The Treaty of Bangkok is seen as conceived in the first place to ban Chinese and American nuclear weapons from the region; its drafters no doubt also hoped to ensure the absence of nuclear weapons from all of southern Asia. The Bangkok Treaty was sometimes seen as a step towards the encirclement of the entire southern hemisphere with a nuclear-weapon-free belt, but this move has been frustrated by the recent tests in southern Asia.

Mention must be made here of several proposals for further nuclear-weapon-free zones, among them a proposal by Belarus for a nuclear-weapon-free zone "from the Baltic to the Black Sea"; the active campaign of Central Asian states for a zonal arrangement in their region; and the move by the two Koreas, so far frustrated, to denuclearise their peninsula. These initiatives are worth pursuing; nuclear-free zones are a concept whose time may have come in many parts of the world, where regional problems call for regional solutions. A prominent proposal, made originally by Iran with specific reference to nuclear weapons, and strongly pushed ever since by Egypt, to make the Middle East into a

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25. *Comprehensive Study of the Question of Nuclear-Weapon-Free Zones in all its Aspects*, Special Report of the Conference on Disarmament, United Nations, New York, 1976, 98 pp., UN sales no. 76.I.7.

26. See Olu Adeniji, *"The African Nuclear-Weapon-Free Zone Treaty: The Pelindaba Text and its provisions"*, in *Disarmament*, a periodic review by the United Nations, Vol. XIX, No. 1, 1996, pages 1 - 20.

zone free of weapons of mass destruction, has been under discussion virtually ever since there were reports about Israel's nuclear-weapon programme. This is an issue of heated dispute in many international fora, prominent among them, NPT Review Conferences. There is clearly little chance of an early agreement on this subject. Meanwhile, reports of other states of the region harbouring nuclear-weapon ambitions add to the relevance of the subject.

PTBT and CTBT

The nuclear non-proliferation regime is further supported by a variety of agreements of global scope of which the rationale is as much disarmament as non-proliferation. Foremost among those are the two treaties that prohibit nuclear testing: the Limited (or Partial) Test Ban Treaty (PTBT), which bans nuclear weapon tests in the atmosphere, in outer space and underwater, and entered into force in 1963, and the Comprehensive Test Ban Treaty (CTBT), which was opened for signature in September 1996. The main reason why a prohibition on nuclear tests is considered as a non-proliferation measure is that, while a simple nuclear device could probably be put together without testing with the reasonable expectation that it will explode, it is said to be very difficult, if not impossible, to produce a more sophisticated so-called "boosted" weapon without making sure of its effectiveness through a nuclear test.

Control and Reduction of Nuclear Material

For completeness' sake, mention should be made also of a different approach to reinforcing the non-proliferation regime, which is by adopting measures that reduce the risk of nuclear-material diversion, in addition to safeguards and export controls. Among such measures there have been various schemes – both global and regional – for the storage under international (i.e. the IAEA's) supervision of plutonium not immediately required for peaceful uses by the countries participating in the scheme.[27] Another idea has been the creation of international fuel-cycle projects and the co-location of facilities that would operate under some form of international authority; this presumably would reduce the possibility of diversion, facilitate the application of safeguards and cut down on transport of nuclear material. One variation on this theme is the initiative of the two major nuclear-weapon states of submitting nuclear material from their military stockpiles, that has been declared surplus to their needs, under international safeguards. The ways in which this is to be carried out is under active discussion; one technical issue to be solved is how to do this without revealing to the international inspectorate, classified information. One proposal which has long been the subject of serious consideration and which was explicitly mentioned by the NPT Extension Conference of 1995 as a high priority among necessary nuclear non-proliferation and disarmament steps, is an internationally supervised agreement on the cut-off of the production of nuclear materials for weapons purposes – the Fissile Material Cut-Off Treaty (FMCT). Discussions on the FMCT are currently taking place in the Geneva Conference on Disarmament, but disagreements on several aspects, particularly the scope of the Treaty (should it cover just the production of further fissile material or should it also pertain to stocks of material already produced?) as well as the extent and mode of verification, have so far prevented it from being realised.

27. Article XII, A 5 of the Agency's Statute makes express provision for this measure, by giving the organisation the "right" to "require" that surplus plutonium be deposited with it. This provision is a vestige of the Baruch Plan, which foresaw direct control over nuclear material.

Physical Protection

The Advanced Training Seminar for which this article was originally produced has given much attention to the physical protection of nuclear material against theft and diversion, during national and international transport, and the protection against sabotage of nuclear facilities. In assuring that nuclear material remains where it is supposed to be, physical security is a logical corollary of nuclear safeguards. International efforts in this area began in the early 1970s, when the IAEA began to publish recommendations for the physical protection of nuclear material. In 1977, the Agency published a comprehensive set of non-binding recommendations for States' systems of physical protection; requirements for protection of nuclear material in use and storage, and for physical protection of nuclear material in transit.[28] The initial modest approach was a lead-in to an ever wider effort to encourage states to agree on protection standards for nuclear material in international transport and domestic use, storage and transport. Following suggestions made at the first Review Conference of the NPT, in 1975, the idea took hold of incorporating some of the recommendations into a Convention. Accordingly, the Convention on the Physical Protection of Nuclear Material was opened for signature in March 1980; it entered into force in 1987. Since then, there have been proposals for revision and extension which remain under active consideration.

The issue of physical protection is evidently connected with countries' domestic security and the maintenance of law and order. The IAEA has always used great caution towards attempts to internationalise activities in this field to avoid infringing upon states' sovereign rights. States have become well aware of the importance of the issue, however, and are increasingly prepared to be advised on the subject, in the interest of security and safety.

Nuclear Material Trafficking

A relatively new feature in the nuclear non-proliferation context is that of international trafficking in nuclear materials. So far, this phenomenon has appeared only in very few instances. Cases reported in the press have pertained so far to only small quantities of nuclear material relevant for nuclear-weapon production. The great majority of smuggling cases of nuclear material involved very small quantities and rarely anything but natural or low-enriched uranium, viz. nothing directly useful in a military programme. The majority of cases pertained to other radioactive material – sometimes by itself potentially harmful but of no relevance to the production of nuclear weapons. However, even if the risk of significant quantities of nuclear material suitable for use in a weapons programme being obtained by individuals or governments interested in the production of such weapons is small, the potential effects are so large that it cannot be disregarded. The great majority of states, if perhaps not all, will do what they can to minimise that risk. This is clearly part of every state's police functions; the only aspects of the issue that might lend themselves to international action are the exchange of information on instances of nuclear-material trafficking – such as the nature of the material involved; the source from which and the way in which it was obtained; the perpetrator(s); the route by which it is being, or has been, smuggled; and the presumed destination – and possibly the provision of advice on experiences gained by states in attempts to prevent and/or follow up on cases of nuclear-material trafficking. Efforts of this kind can form a valuable element of the non-proliferation regime.

28. See IAEA document INFCIRC/225/Rev.1, of June 1977.

Conclusion

This summary tries to show that no single measure by itself can prevent the spread of the capability to manufacture nuclear weapons. The world community, regional organisations, and individual countries have devised a multitude of ways to reduce the risk of a nuclear weapons spreading. The resulting set of agreements, understandings, regulations, adopted in a world-wide, regional and national context, forms a variegated, kaleidoscopic structure with great strengths as well as large holes. That structure has met its purpose in important cases and it has failed in other instances.

This paper has tried to indicate, in very general terms, how the structure – which for want of a better term we call the non-proliferation regime – came about and how it operates – or is meant to operate. It is of the greatest importance that government officials and academics involved in the topic should be aware that it is each of their States and every one of their governments that must do what they can to make the regime work and to reinforce it where it shows shortcomings. From the enforcement of Security Council sanctions in cases of non-compliance, down to police action against traffickers in radioactive materials, it is States that must make the regime function, in their own enlightened interest, just as it is States' ignorance and lack of care that can make it fail. It is States' rules and regulations and the way they are enforced that form the foundations on which the regime is built. And it is through co-operation between States that the requirements of the non-proliferation regime can be met and its promises can be converted into reality.