

Section 1

Nuclear Energy and Nuclear Weapons: An Introductory Guide

Nuclear Materials

A chemical element consists of basic building blocks, called atoms, which themselves contain 'sub-atomic' particles. These particles are of three types: protons, neutrons and electrons. Protons (positively charged particles), together with neutrons (uncharged particles) make up an atom's core or nucleus. Electrons (negatively charged particles) are identical in number to the protons, but are found outside of the nucleus of the atom. All chemical elements are defined and distinguished from each other by the number of protons/electrons their atoms contain, termed their atomic number. Examples of atomic numbers are 1 for an atom of hydrogen and 93 for an atom of plutonium.

While all atoms of an element must have the same number of protons/electrons, they may contain differing numbers of neutrons. These variants are called isotopes of an element. They have different nuclear properties and masses/weights but their chemical properties are identical: thus they can only be separated by making use of their differing masses, and not by chemical means.

Isotopes are normally identified by the sum of their protons and neutrons. Thus 'Uranium 235', often shortened to the notation ' U^{235} ' (or 'U-235') indicates the isotope of uranium that contains 235 (92+143) protons and neutrons in the nucleus of each atom. 'Plutonium 239', or ' Pu^{239} ' (or 'Pu-239') indicates the isotope of plutonium that contains 239 (93+146) protons and neutrons in the nucleus of each atom.

Nuclear Reactions

Fission

Nuclear fission is the splitting of the nucleus of an atom into two or more parts. This is a process which normally only occurs when heavy elements such as uranium and plutonium are bombarded by neutrons under favourable conditions. Not all isotopes of these elements fission under such circumstances; those that do are called fissile materials. The most frequently used fissile materials are the isotopes Uranium 235 (U-235) and Plutonium 239 (Pu-239).

These isotopes are not found in their pure form in nature. U-235 forms only 0.7 per cent of natural uranium ore which is mostly made up of non-fissile U-238. Plutonium does not exist at all in natural form and has to be manufactured from uranium. This is done by placing it inside a reactor, where some U-238 nuclei will capture slow moving neutrons to form fissile Pu-239.

When a fissile material is bombarded with neutrons, it splits into atoms of lighter elements. This process releases large quantities of energy and neutrons. If these neutrons hit and split additional 'fissile' nuclei, more neutrons are released to continue the reaction. If there is a sufficient concentration of atoms of fissile isotopes, known as a 'critical mass', this reaction will be self-sustaining. This is a 'chain reaction'.

A critical mass is the smallest amount of material required for a chain reaction. This may be affected by variables such as the concentration of the fissile isotopes in the material; its density — if it is compressed the critical mass is reduced; and its physical configuration — a sphere or some other shape.

Fusion

Fusion takes place when two nuclei of light elements such as hydrogen fuse together to make a heavier one. While this process releases much larger quantities of energy than the fission process, it also requires large amounts of energy to initiate it. For fusion to occur, the repellant forces that arise between the positively charged protons in the two nuclei have to be overcome, and temperatures of over 100 million degrees centigrade are normally required for this to occur. The most frequently used materials to generate fusion reactions are tritium (H-3), deuterium (H-2) and the solid Lithium-6 Deuteride, which when heated to the temperature of the fusion reaction, breaks down into tritium and deuterium.

Nuclear Reactors

Fission Reactors

There are several features common to all fission or (as they are more

usually termed) nuclear reactors.

The first of these is that they contain a core or mass of fissile material (the fuel) which may weigh tens of tons, within which energy is produced by sustaining a regulated chain reaction. The fissile material used varies between reactor types, but it may be natural uranium (which contains 0.7 per cent fissile U-235) or uranium which has been enriched to increase the percentage of U-235 to around 3 per cent. Alternatively, plutonium 239 produced by the irradiation of U-238 in a reactor, or uranium 233 (U-233) produced from thorium 232 (Th-232) may be used, or a combination of these mixed with uranium (mixed oxide fuels or MOX). This fuel is usually in rod or pin form, and is clad in a gastight containment material such as stainless steel.

A second related feature is the presence of a means of regulating the chain reaction. This normally takes the form of control rods which absorb neutrons, and which can be inserted into the core to reduce the rate of fission or to shut down the reactor.

The fissile core of a reactor is usually surrounded by a third common feature, a moderator. This material is chosen because it slows down some of the faster neutrons so that these can more easily hit nuclei and initiate fission, and thus maintain the chain reaction. The moderator can be ordinary (or light) water, heavy water (deuterium oxide) or graphite.

A fourth common feature is a means of removing the heat produced by the chain reaction from the core of the reactor. This cooling system can also provide the heat and steam to drive turbines and thus generate electricity.

Finally, there is a containment vessel which serves to shield the radioactive core from other parts of the reactor system. Lining this vessel is a reflector which increases the efficiency of the fission process. In addition, a reactor will itself normally be surrounded by a further thick containment structure, whose purpose is to contain any release of radioactivity and prevent it escaping into the surrounding environment.

Reactors have been built to serve four broad purposes. First, a significant proportion of the reactors in the world are large units designed to produce steam to drive turbo-generators, and thus to generate electricity for civil uses. Second, there are smaller units of a similar type which are used in naval vessels, especially submarines, to generate electricity for propulsion purposes or to drive turbines. Third, there are many small materials testing and research reactors, which usually have no turbo-generators attached and are used mainly for experimental purposes. For many years these used small kilogram quantities of highly enriched uranium as fuel, but its proliferation potential has led to a global attempt to replace it with fuel of lower enrichment. Finally, there are large units used by the nuclear-weapon states to produce plutonium for military explosive purposes, some of which do not have turbo-generators attached to them.

There exist five different nuclear reactor technologies:

Light Water Reactors (LWRs)

This is the most widespread power reactor type found in the world today. It uses low enriched (3%) uranium as fuel, which enhances its efficiency as an electricity generator by enabling the fuel to stay longer in the reactor. It also uses ordinary water as both a moderator and coolant. There are two variants of this reactor, Pressurized Water Reactors (PWRs) and Boiling Water Reactors (BWRs), the chief difference between them being in their method of producing steam to make electricity. Small LWRs are also used to power submarines and other naval vessels. LWRs are a costly and inefficient way of producing Pu-239.

Heavy Water Reactors (HWRs)

In these type of reactors, heavy water is used as both the moderator and coolant. Heavy water absorbs so few neutrons that it permits the use of natural uranium as fuel. This type of reactor, the majority of which are called CANDUs, uses up so much of the fissile U-235 in its natural uranium fuel that it is probably uneconomic to reprocess and recycle it, and the preferred option is to store it and dispose of it as waste. It is also a good producer of plutonium, and this type of reactor has been used in the United States without any turbo-generators

attached to produce materials for weapon purposes. To produce Pu-239, rather than to minimize electricity generation costs, fuel re-loading takes place more frequently. Thus a distinction between civil and military use is the length of time the fuel remains in the reactor.

Gas Cooled Reactors (GCRs or MAGNOX)

These are moderated with graphite and cooled with carbon dioxide gas. Most use natural uranium fuel encased in a magnesium oxide-based cladding called MAGNOX. As this corrodes if stored in water, it needs to be reprocessed for environmental and safety reasons. Its design originated in the reactors used to produce plutonium for military purposes in France, the United Kingdom and the USSR.

High Temperature Gas Cooled Reactors (HTGRs)

The HTGR is cooled with helium gas and moderated with graphite. Highly enriched uranium is used as fuel (93 per cent U-235), though this may be mixed with Th-232. The attraction of this type of reactor is that much of the uranium in the fuel is burned up, requiring infrequent reloading, and the extremely high operating temperatures enable it to be linked to very efficient, modern turbo-generators when used to produce electricity.

Liquid Metal Fast Breeder Reactors (LMFBRs)

Breeder reactors normally have a core of highly enriched uranium or plutonium, which can produce enough surplus neutrons to convert U-238 in a blanket around the core into Pu-239 at a rate faster than its own consumption of fissile material. They thus produce more fuel than they consume. They operate without a moderator, and at very high temperatures. The coolant is normally a liquid metal, such as sodium, which allows for the rapid removal of heat. These reactors have traditionally been seen as a means of utilising the plutonium produced by the other types of reactor, but are also capable of producing plutonium ideal for use in weapons.

Fusion Reactors

Although many attempts have been made to produce a working fusion reactor, these only exist in experimental form. The temperatures at which fusion is achieved are so great that no known material will hold the fusing materials. Containment of the material is being attempted using magnetic fields.

Nuclear Weapons

Fission Devices

A fission weapon or device is designed so that a critical mass of fissile material can be assembled and held together before the device blows itself apart. The yield of the weapon is determined by the amount of fissile material involved, the number of nuclei fissioned, and the number of generations of fissions that can be achieved before disassembly takes place.

A simple fission weapon design, also known as a first-generation nuclear weapon, can be of either the 'gun barrel' or 'implosion type'. A gun device involves bringing together rapidly two sub-critical masses of highly enriched uranium by propelling one of them with an explosive along a thick tube or gun-barrel so that it impacts with considerable velocity upon the other. This creates conditions for a chain reaction. This method is conceptually simple but the explosive power of the weapon tends to quickly force the fissile material apart so that little of the material goes through the fission process. It is therefore relatively inefficient in its use of fissile material. This method cannot be used with plutonium.

An implosion weapon works by compressing a sub-critical spherical mass of fissile material until it becomes critical. The fissile material is surrounded by a neutron reflector, usually of beryllium, and a heavy metal tamper of either U-238 or tungsten. Surrounding this assembly is a further hollow sphere of conventional explosives. If the conventional explosive can be detonated so as to produce a uniform, symmetrical implosion, the tamper is propelled inwards into the sphere of fissile material, and compresses it into criticality. The forces generated by the conventional explosives then contain the gaseous sphere of fissile materials while many repetitions of the fissile reaction occur, and the full yield of the device is produced.

Boosted-Fission Devices

A fission device can be 'boosted' to increase its yield by placing within its core a small quantity of fusion material, such as tritium. At the great temperatures and pressures found within the gaseous core of an

exploding device, this material fuses and releases an extra quantity of neutrons which, in turn, produce additional fissions in the uranium or plutonium used in the device. More of the fissile material is thus consumed than in a simple fission device, the efficiency of the fission process is improved and a higher yield produced.

Fusion (Thermonuclear) Devices

The energy released by such a device, also known as a second-generation nuclear weapon, arises primarily from nuclear fusion in isotopes of hydrogen such as tritium and deuterium. A large energy source, such as a fission device, is needed to start a fusion reaction. A fusion weapon thus has at least two stages which contribute to the yield, the fission trigger or primary device and the thermonuclear secondary device. In addition, these two devices may be contained in a shell of U-238 which constitutes a third stage of the device. This material, whilst it cannot maintain a self-sustaining fission explosion, can be made to fission where there is a constant external supply of fast neutrons from other fission or fusion reactions. There can be any number of fission-fusion-fission-fusion steps, and so no limit in theory to the size and yield of a thermonuclear weapon.

Nuclear Testing

In order to develop and build an operational nuclear explosive device different types of testing are needed. It is possible to test the functioning of a nuclear weapon with a high degree of reliability not only in a full-scale nuclear explosion, but also through sophisticated tests conducted on a smaller scale. The implosion mechanism of a nuclear weapon can be studied with the help of hydrodynamic experiments (HDEs) where the fissile material in the core is replaced by non-fissile substances. The first stages of an explosive nuclear chain reaction may be observed in hydronuclear experiments (HNEs) where only a small amount of fissile material is placed in the core of a device, allowing it to sustain a nuclear chain reaction for a few generations only. Additionally, subcritical experiments and other laboratory experiments (e.g nuclear fusion induced by laser ignition) can be used to get a better understanding of the physical processes involved in the development, design and construction of a nuclear explosive device.

Weapon-Grade Fissile Materials

The size of a fission device is directly related to the concentration of fissile isotopes in the material in the core. For purposes of producing a practical weapon, the minimum enrichment required for uranium is about 50 per cent. However, to enable compact, light designs to be produced, the present nuclear powers are assumed to use in their weapons about 10–25 kilos of uranium enriched to over 90 per cent U-235. This enriched material is produced in an enrichment plant (see below).

Plutonium is often preferred to uranium in weapon designs, as less plutonium than uranium is required to produce a given yield — about 5–8 kilos is assumed to be required for a simple device. Plutonium with 93 per cent or above Pu-239 constitutes weapons grade material, though there are claims that devices have been exploded using plutonium with much lower concentrations of this isotope. Such weapons, however, tend to have uncertain yields and give off dangerous radiation, so the higher concentrations are preferred.

All fission reactors produce plutonium, but reasonably pure Pu-239 can only be obtained by withdrawing the uranium fuel after a short period (2–6 months) in the core. If the fuel is left in for a longer period, significant amounts of Pu-240 and other heavier isotopes are contained in the plutonium. Typically, Light Water Reactors (LWRs) will have plutonium in their used fuel which has a concentration of Pu-239 below 80 per cent. Plutonium is obtained from spent reactor fuel through a chemical process known as reprocessing.

Enrichment

Uranium must be enriched if it is to be used in certain reactor types and in weapons. This means that the concentration of fissile U-235 must be increased by physical, rather than chemical, means before it can be fabricated into fuel. The natural concentration of this isotope is 0.7 per cent, but a concentration of 3 per cent is necessary in order to sustain a chain reaction in an LWR. Some 90 per cent enrichment is required before use in HTGRs, the majority of submarine propulsion units or fission weapons. This process of enrichment is not linear, and as much enrichment effort, or 'separative work' as it is usually termed, may be involved in achieving enrichment from, say 0.7 to 1 per cent as from 10–90 per cent.

There are six main techniques for increasing the concentration of U-235:

Gaseous Diffusion

This was the first method of enrichment to be commercially developed. The process relies on a difference in the mobility of different isotopes of uranium when they are converted into gaseous form. In each gas diffusion stage uranium hexafluoride gas (UF₆) is pumped under pressure through a porous nickel tube (a cascade) which causes the lighter gas molecules containing U-235 to pass through the porous walls of the tube more rapidly than those containing U-238. This pumping process consumes large amounts of energy. The gas which has passed through the tube is then pumped to the next stage, while the gas remaining in the tube is returned to lower stages for recycling. In each stage, the concentration of U-235 is increased only slightly, and enrichment to reactor grade requires a facility of approximately 1200 stages. Enrichment to weapons grade requires about 4000 stages. Industrial scale facilities of this type require electricity supplies of hundreds of megawatts of power.

Gas Centrifuge

In this type of process uranium hexafluoride gas is forced through a series of rapidly spinning cylinders, or centrifuges. The heavier U-238 isotopes tend to move to the side of the cylinder at a faster rate than the lighter molecules containing U-235. The gas at the centre is removed and transferred to another centrifuge, where the process is repeated. As it moves through a succession of centrifuges, the gas becomes progressively richer in the U-235 isotope. Electricity requirements for this process are relatively low compared with gaseous diffusion, and as a consequence this process has been adopted for most new enrichment plants.

Aerodynamic Separation/Becker Process

The Becker technique involves forcing a mixture of hexafluoride gas and either hydrogen or helium through a nozzle at high velocity and then over a surface in the shape of a curve. This creates centrifugal forces which act to separate the U-235 isotopes from the U-238. Aerodynamic separation necessitates fewer stages to achieve comparative enrichment levels than either gaseous diffusion or gas centrifuges but consumes much more energy.

Laser Enrichment

The laser enrichment technique involves a three stage process; excitation, ionization and separation. There are two techniques to achieve these effects, the 'Atomic' approach, and the 'Molecular' approach. The Atomic approach is to vaporize uranium metal and subject it to a laser beam at a wavelength that excites only U-235 molecules. The vapour is then exposed to a second laser beam that ionizes the U-235 atoms, but not the unexcited U-238 atoms. Finally, an electric field sweeps the U-235 atoms onto a collecting plate. The Molecular approach also relies on differences in the light absorption frequencies of uranium isotopes, and begins by exposing molecules of uranium hexafluoride gas to infra red laser light. U-235 atoms absorb this light, thereby causing an increase in their energy state. An ultra-violet laser can then be used to break up these molecules and separate

the U-235. This process has the potential to produce very pure U-235 with minimum energy requirements, but has not yet advanced to an industrial scale level of production.

Electro-Magnetic Isotope Separation (EMIS)

The EMIS process of enrichment is based on the fact that an electrically charged atom, travelling through a magnetic field, moves in a circle whose radius is effected by the ion's mass. EMIS is achieved by creating a high current beam of low energy ions and allowing them to pass through a magnetic field created by giant electro- magnets. The lighter isotopes are separated from heavier isotopes by their differing circular movements.

Chemical Separation

'Chemical Separation' is something of a misnomer as the differing isotopes of an atom are chemically identical. This form of enrichment exploits the fact that ions of these isotopes will travel across chemical 'barriers' at different rates because of their different masses. There are two methods to achieve this: the method developed in France of solvent extraction; and the process of ion exchange used in Japan. The French process involves bringing together two immiscible liquids in a column, giving an effect similar to that of shaking a bottle of oil and water. The Japanese ion exchange process requires an aqueous liquid and a finely powdered resin which slowly filters the liquid.

Reprocessing

This is a process whereby the uranium and the plutonium in spent fuel discharged from a reactor is separated from the other 'fission products' by chemical means. It may then be recycled into reactor fuel or, in the case of plutonium, may be used in weapons. Reprocessing is usually carried out using mechanical and solvent extraction techniques, and occurs in three steps.

Solution

After a period of storage to reduce their radioactivity the fuel assemblies are cut into short sections in what is termed the 'head-end' stage. These pieces are then placed in a nitric acid solution to dissolve the fuel. This acid solution is centrifuged to remove undissolved solids, and chemically treated in preparation for the separation process.

Separation

In this separation stage the 'Plutonium Uranium Recovery by Extraction' (PUREX) method may be employed, with the solution being fed into extraction columns and mixed with various chemicals. The plutonium and uranium emerge from this in the form of nitrates.

Purification

The third stage involves purifying the recovered materials. Recovered uranium can be recycled into new fuel, although sometimes this involves further enrichment. Recovered plutonium may be used as fuel in breeder reactors, to make mixed oxide (MOX) fuel or, if of a suitable isotopic composition, to make weapons.

Section 2

The Evolution of the Nuclear Non-Proliferation Regime, 1945-1970

Introduction

In the mid-1960s, it was assumed by many knowledgeable commentators that, as the inevitable diffusion of information on the design and manufacture of nuclear explosives took place and supplies of uranium became more accessible, the number of states possessing nuclear weapons would increase. However, both superpowers, the United States (US) and the Soviet Union (USSR), were motivated to prevent this if they could, for very specific reasons of national interest. The US was concerned that it might be dragged by nuclear-armed allies into a catastrophic war that it could not control. The USSR had recently discovered through the actions of China that it was not only NATO nuclear weapons that could be a potential threat to its security and, unlike the US, several of the potential nuclear-weapon states (NWS) bordered its territory.

The two most recent nuclear proliferators had been France (1960) and

China (1964). The states regarded as technically equipped to follow them within the next ten years were either allies of the United States (Australia, Canada, the Federal Republic of Germany, Italy and Japan); states pursuing policies of armed neutrality (Sweden and Switzerland); or states involved in acute regional conflicts (India, Israel, the Republic of Korea and Taiwan, Province of China). Yet despite the technological determinism infusing the views of those contemporary commentators on nuclear proliferation who argued that "those who could, would", the two superpowers embarked on an attempt to change these expectations by erecting a consensual, political and institutional barrier to further nuclear proliferation. They did not do this in a vacuum. Since 1945 both superpowers had been involved in intermittent negotiations to limit their nuclear arms race and engage in nuclear disarmament: preventing further nuclear proliferation was an integral part of these activities.

Attempts to Control Nuclear Weapons, 1945-1965

In June 1946 the US had submitted the Baruch Plan to the UN Atomic Energy Commission, whose remit was to make proposals for the elimination of nuclear weapons and the implementation of international control over the exploitation of nuclear energy for peaceful purposes. This plan proposed international managerial control or ownership over all potential weapon-related nuclear facilities, as well as powers to licence and inspect all other atomic energy activities. The USSR had responded by submitting a similar plan based on national, rather than international, ownership and control over nuclear facilities. Neither plan was implemented, due in part to the different attitudes of the two states towards international control of nuclear activities. One aspect of the US response to this situation was legislation imposing rigorous national controls over the transfer of nuclear-related information and materials, in the mistaken belief that there was a 'secret' surrounding atomic weapons which could be denied to others.

In September 1949 the USSR exploded its first atomic explosive device, and in October 1952 the United Kingdom followed this with its own explosion in Australia. Although both used information derived from the US wartime programme to assist their work, these events demonstrated that the 'secret' of creating a fission explosive was no longer the exclusive monopoly of the US and, perhaps more significantly, that the necessary scientific knowledge to create such a device could be acquired by the indigenous efforts of other states. In parallel, newly discovered uranium deposits in Canada, the US and Australia indicated that the ability of the existing Belgian-Canadian-UK-US arrangements to monopolise world supplies and trade in this precursor nuclear material would not last. At the same time the prospects for an increased global supply of uranium opened the way to serious development work on the use of nuclear energy as a civil power source, especially for electricity production. Yet such facilities could be operated to both produce civil power and weapon-usable plutonium, as the UK was already planning to do at Calder Hall, its first nuclear power station, that opened in 1956.

These developments, among others, led US President Eisenhower to make his 'Atoms for Peace' speech to the UN General Assembly in December 1953 proposing that the NWS should assist other states in developing the peaceful uses of atomic energy. One motivation for this was a desire to slow the expansion of the USSR nuclear arsenal, thus delaying its acquisition of the capability to mount a 'knock-out blow' upon the US. This would be achieved by forcing it to match US transfers of weapon-usable fissile material to an international agency whose creation was proposed in Eisenhower's speech, which in turn would supply them to other states for peaceful uses. Another motivation was a mistaken belief that plutonium produced in power reactors could not be used for military explosive purposes as it would be 'denatured'. A third was a recognition of the need to start to grapple with what was perceived to be a central issue for future nuclear-weapon control activities. This was the need to constrain the potential negative consequences for the non-proliferation of nuclear weapons that would flow from an ever increasing number of states developing nuclear power programmes, and the necessity to do this through voluntary and co-operative international arrangements, rather than attempts by the US and other technology holders to deny them access to nuclear energy capabilities.

Negotiations on such international arrangements started in 1954, based upon the USSR's 1946 position of accepting national ownership and management of all nuclear activities within a state, but overlaying this with international arrangements to provide assurances that these activities were not being used for military explosive purposes. These negotiations culminated in a multilateral Conference on the Statute of the International Atomic Energy Agency (IAEA), held in New York during September and October 1956. Following agreement on its statute at this Conference, the Agency started its work in Vienna in July 1957 with a triple remit: to assist in the development of nuclear energy for peaceful purposes; to provide assurances that facilities and materials declared to be for such purposes were not being diverted to other uses; and to provide early warning if they were.

In parallel, the US had been engaged in two related activities on a bilateral, or a narrow multilateral, basis. Both were made possible by changes contained in its Atomic Energy Acts of 1954 and 1958, which had been enacted to respond to the new civil and military nuclear environment that confronted the US. The first was the negotiation of bilateral Agreements for Co-Operation in the Peaceful Uses of Atomic Energy with many states, permitting transfers of information, technology and materials forbidden by earlier legislation. The second was the

passing of a limited range of technical information on its nuclear weapon designs to US allies, so that they could procure equipment that would enable them to deliver US nuclear weapons in times of war, as well as train their forces to operate in a nuclear weapon environment.

One consequence of the first of these arrangements was to undermine the launch of the IAEA. States preferred to seek assistance and materials bilaterally from the US, rather than multilaterally through the IAEA, and arrangements to assure the agreed use of this assistance were initially made on a bilateral, rather than multilateral, basis. As a consequence it was 1959 before the IAEA was given the opportunity to exercise its safeguarding powers over nuclear materials, following an agreement for it to supply Canadian uranium to a Japanese research reactor.

There were several motivations behind the arrangements for limited transfers of technical information on US weapons to allies. One was a US desire to have its allies pay part of the costs of providing the West's nuclear deterrent capability, by providing expensive delivery capabilities. Another was the necessity to respond in a constructive way to indications that several Western European states were engaged in active national nuclear weapon programmes, with the French one being the most advanced. The arrangements involved the US supplying those of its allies who participated in these arrangements with the data to enable them to deliver US nuclear weapons in time of war in accordance with pre-determined NATO plans. The hope was that this would remove much of the incentive for such states to continue with national programmes to acquire their own weapons. In peacetime, the nuclear weapons earmarked for transfer to allies were to be stored under US military custody in the countries involved, and no formal transfer was to occur unless hostilities were well established.

In the US Atomic Energy Act of 1958, additional arrangements were made in respect of existing declared nuclear-weapon state allies which had made 'substantial progress in the development of atomic weapons'. At the time, the only state which qualified was the United Kingdom. The effect of the new legislation was to enable close collaboration over the development and manufacture of nuclear weapons to occur with such countries, but not the transfer in peacetime of custody of complete nuclear devices. Similar arrangements were made with France in 1985.

One further factor complicating the development of the IAEA's functions during this period was the establishment in January 1958 of a regional nuclear organisation within the framework of the European Communities (EC), the European Atomic Energy Community (EURATOM). This was tasked with co-ordinating nuclear energy development within the EU, as well as implementing a regional safeguards system to ensure that materials were not diverted 'to purposes other than for those which they are intended'. EURATOM safeguards were based on a different concept from those of the IAEA, and one that was very similar to the ideas contained in the Baruch Plan. EURATOM claimed legal ownership over all the fissile materials in member states, except those in the military programmes of NWS, and dealt directly with the enterprises handling them, rather than the governments within whose jurisdiction they were situated. The US negotiated an Agreement for Co-operation with EURATOM, and accepted that it, and not the IAEA, would safeguard materials and facilities transferred under this Agreement, thereby undermining the jurisdiction of the Agency.

By the first half of the 1960s, several developments relevant to nuclear non-proliferation were thus occurring in parallel. One was the slow evolution of the IAEA and its international safeguarding activities; the second the implementation of plans to provide allies of the United States with nuclear weapons; a third the dissemination of nuclear knowledge to a wide range of states to enable them to develop the peaceful applications of nuclear energy; and the fourth the development of a nuclear disarmament negotiating process.

In 1961, spurred on by the request from Japan, the IAEA promulgated its first set of arrangements for implementing Agency safeguards on nuclear materials and facilities, known by the number of the IAEA information document through which they were published, Information Circular (INFCIRC)/26. These arrangements were soon superseded by a second, more comprehensive, set, INFCIRC/66, which in its final form in 1968 incorporated a set of technical principles and procedures designed to verify compliance with existing safeguards agreements and thus enable the IAEA to give assurances that the nuclear activities involved were not being used for military purposes. INFCIRC/66 covered research and power reactors, spent fuel reprocessing plants,

fuel fabrication and conversion plants and fuel and materials storage facilities, but did not include uranium enrichment plants or production facilities for the heavy water used as a moderator in some nuclear reactors.

From 1962 onwards the US started to transfer to the IAEA responsibility for monitoring the civil nuclear transfers it had made under its bi-lateral Agreements for Co-operation, thus promoting the growth of the Agency's safeguarding functions. In addition, as orders started to be placed for nuclear power reactors by states in Western Europe and elsewhere, a condition for their supply by the US and the United Kingdom became acceptance of INFCIRC/66 safeguards over their operations, thus further strengthening the authority of the Agency.

Nuclear disarmament negotiations between the US, the USSR and some of their allies were initiated in the mid-1950s when the theoretically unlimited destructive capacity of the thermonuclear, as against atomic, weapons started to be fully appreciated. The aim was to first halt the nuclear arms race, and then reverse it through the dismantlement of existing nuclear weapons. Halting the nuclear arms race was seen to involve two distinct activities: the qualitative one of preventing further testing of nuclear devices, in order to freeze nuclear weapon development at its existing levels; and the quantitative one of halting the production of fissile material for military purposes, thus placing a limit on the numbers of nuclear weapons that could be built by the existing nuclear weapon states. In addition, two other activities were taking place on a wider, multilateral basis. In 1959, through the Antarctic Treaty, the first attempt was made to reach agreement on measures to prevent the emplacement of nuclear weapons in specific environments, while in 1958 Ireland had initiated moves within the UN General Assembly to highlight the dangers posed by additional states acquiring nuclear weapons. This culminated in 1961 in the 'Irish Resolution' being adopted by the UN General Assembly. This called both for measures to limit the spread of nuclear weapons to additional countries and for all states to refrain from the transfer or acquisition of such weapons.

Although negotiations on a Comprehensive Ban on Nuclear Testing (CTBT) led to a moratorium on nuclear testing by the three existing NWS from 1958–61, they did not produce agreement on a treaty, in the main because of irreconcilable differences over the intrusiveness of its verification system. In 1961 the USSR resumed testing, followed rapidly by the US, and in 1963 the attempt to agree a CTBT was abandoned in favour of a treaty which banned tests in all environments except underground, known as the Partial Test-Ban Treaty (PTBT). In the next year the attempt to reach an agreement on a cut-off of the production of fissile material for military purposes was shelved in the light of the increasing numbers of nuclear power plants under construction in the nuclear weapon states. This was seen to generate insurmountable difficulties to the provision of credible assurances that any agreement was being complied with, especially in states such as the USSR where all facilities were owned by the government and where the distinction between military and civil use was inevitably somewhat arbitrary. This abandonment was tacitly announced through a series of statements made by leaders of the three NWS in the Spring of 1964, in which they announced unilateral measures to limit their future production of fissile materials for military purposes.

The demise of the attempt to place quantitative and qualitative limits on the existing nuclear arms race coincided with a more comprehensive attempt to address the issue of nuclear disarmament within the United Nations, through the medium of proposals for General and Complete Disarmament (GCD). The motivation for this stemmed, in part, from the existing military situation in Europe, where the expansion of NATO's ability to fight a ground war with nuclear weapons was seen as a necessary response to the Warsaw Pact's perceived qualitative superiority in conventional weaponry. It was only by addressing both conventional and nuclear weaponry in parallel that agreement on nuclear disarmament appeared possible. One consequence of this was the Macloy-Zorin principles of 1962, which attempted to lay down a set of guidelines for future nuclear disarmament negotiations. Another was an acceptance that negotiating GCD as a single package was probably impossible, and that the most practical way forward was to disaggregate it and conduct negotiations on the separate elements sequentially. The first items on this new agenda were to be measures such as a CTBT, an agreement to terminate the production of fissile material for military explosive purposes (a Fissile Material Cut-off Treaty or FMCT) and a nuclear weapon non-dissemination and proliferation agreement. While these might not reduce the numbers of warheads deployed, they would support a nuclear disarmament process, and

improve confidence between those involved in it.

The development by the US in the later 1950s of bombers with intercontinental range, ballistic missiles (ICBMs) with similar ranges and submarine-launched ballistic missiles (SLBMs) had generated concern among its Western European allies that this would lead to a decoupling of the defence of Europe and defence of the US homeland in the minds of US leaders. They therefore sought enhanced measures to guarantee that any USSR aggression in Europe would meet with a nuclear response. Expanding numbers of US warheads available for the use of US allies in wartime was one way of doing this: another was a NATO or Western European strategic nuclear force, capable of both striking at Moscow and giving Western European governments direct involvement in its operation and decision making.

Initial proposals for this involved a mixed-manned force of surface vessels equipped with US Polaris ballistic missiles, known as a multilateral force or MLF (two Italian Cruisers were already under construction with provision for carrying such missiles). Later proposals included the creation of an Allied Nuclear Force (ANF) in which UK and some US forces would be committed for use by SACEUR. Not unnaturally, these proposals ran into strong opposition from the USSR and its allies, who viewed the idea of German involvement in such an enterprise with horror. One element in such opposition was a proposal by the Polish Foreign Minister, Rapacki, for a nuclear-weapon-free zone in Central Europe.

The Negotiations on the NPT

It was in this international context of stalled nuclear disarmament negotiations, considerable tensions over the nuclear aspects of European security, and the beginnings of a process of attempting to delimit specific geographical areas as nuclear-weapon-free that discussions, and then negotiations, started in the mid-1960s on a treaty on the Non-Proliferation of Nuclear Weapons (NPT). This was the one element of the GCD package that both the US and the USSR felt motivated to pursue immediately. After considerable informal consultations it proved possible for the 1965 UN General Assembly to adopt a resolution containing guidelines for negotiation of this Treaty. The resolution, 2028, listed five principles that should underpin it:

- it should be void of any loopholes which might permit nuclear or non-nuclear weapon states to proliferate nuclear weapons in any form;
- it should embody an acceptable balance between the mutual responsibilities and obligations of the nuclear and non-nuclear weapon states;
- it should be a step towards the achievement of GCD, and more particularly nuclear disarmament;
- it should have acceptable and workable provisions to ensure its effectiveness; and
- nothing contained in it should adversely affect the right of any group of states to conclude nuclear-weapon-free zone (NWFZ) treaties.

In early 1966, the multilateral negotiating forum for disarmament agreements was the Eighteen Nation Disarmament Committee (ENDC). Several leading non-aligned states were members of this, as well as a number of allies of the two superpowers. The ENDC was an entity linked to, but not part of, the United Nations system, although it met in UN premises in Geneva. One aspect of its structure was that the US and USSR were its co-chairmen. Discussions started in this forum on the text of an NPT, but made relatively slow progress. One problem was that the ENDC did not contain either Germany or Japan, which were two of the states of particular non-proliferation concern at this time. It was left to the US, and to some extent Italy, to liaise with them and try to craft a treaty that they would be prepared to sign. In the autumn of 1966 the US and USSR therefore started bilateral discussions on how to word the sections of the treaty dealing with transfers from the NWS of nuclear weapons and the non-acquisition of such weapons by the non-nuclear weapon states (NNWS).

From a US perspective this treaty had to permit the existing US–UK collaborative arrangements to continue, as well as existing NATO arrangements for the transfer of nuclear weapons for use on NNWS-owned delivery systems in the event of hostilities. From a USSR perspective, the key issue was to prevent any MLF type of arrangement being legitimate under the treaty. Early in 1967 language was agreed between the two states on these articles, which became I and II of the NPT. Their text was based on the contemporary US nuclear energy legislation, which prohibited the transfer by its government of complete nuclear explosive devices to any other state or

international entity in peacetime. The articles allowed existing NATO nuclear arrangements to continue, but effectively foreclosed on any move to adopt multilateral nuclear-weapon sharing within the alliance. They also meant that the NPT had no provision to explicitly prohibit the storage and deployment of NWS nuclear weapons in a NNWS.

Debate within the ENDC then focused throughout the remainder of 1967 on how an effective verification system could be incorporated in the proposed treaty. Although all parties to the negotiations were agreed that it made no sense to create a new treaty-specific system of safeguards in parallel to the IAEA's system, there was disagreement over the position of EURATOM. Its existence meant that several of the Western European states had no national systems for the monitoring and control of their nuclear energy activities, relying on EURATOM for this. However, the USSR considered this a form of self-policing, rather than independent monitoring, and argued that it did not offer it and its allies adequate assurances that the states of Western Europe, in particular the Federal Republic of Germany, would uphold their non-proliferation obligations. It wanted full IAEA safeguards to apply to all states in the region. The US was in a difficult position on this issue, as its NNWS allies were arguing that any verification system should be as non-intrusive as possible, and above all offer no commercial advantages to the NWS who would not have to accept such a system. Eventually, in early 1968, wording was agreed for Article III to allow EURATOM to make an agreement with the IAEA enabling the Agency to apply its safeguards to EURATOM states.

Article III of the NPT left two issues undecided or ambiguous: the detailed nature of the verification system to be applied by the IAEA and the obligations of parties to the treaty in respect of transfers to non-parties. In the case of the former, the text indicated that the safeguards system was to focus on materials, not facilities and materials as was the case with the existing INFCIRC/66 system, but the details of how this was to be done were left to the IAEA to decide. In the case of the latter, the text left it unclear whether transfers to non-parties could be permitted so long as INFCIRC/66 IAEA safeguards were applied to the transfers, or whether the recipient state had to accept IAEA safeguards on all materials within its jurisdiction (known variously as NPT, full-scope or comprehensive safeguards) before any transfer could be allowed.

Article IV was also open to differing interpretations. On the one hand it stated an obvious fact related to the nature of state sovereignty, namely that all states had an 'inalienable right' to economic development, and thus to 'develop research, production and use of nuclear energy for peaceful purposes'. On the other, the implementation of this right should be 'in conformity with Article I and II of this Treaty'. Thus although NPT NNWS parties were committing themselves voluntarily to conditions on the exercise of their peaceful use of nuclear energy, the Treaty also recognised the apparently contradictory fact that their rights to peaceful uses were intrinsically 'inalienable'.

Two further articles of the eventual treaty, Article V dealing with peaceful nuclear explosions and Article VII dealing with NWFZ proved relatively uncontroversial. In order to prevent any state acquiring a nuclear weapon under the guise of it being a device for use in a civil engineering project, the treaty specifically banned all work by its NNWS parties on any type of nuclear explosive device, but Article V permitted the supply of such devices for 'peaceful' purposes by existing NWS, as a consequence of international arrangements to be negotiated through the IAEA. In the case of NWFZs, Latin American states had decided by 1967 to go ahead with their own regional treaty, partly motivated by a belief that the problems arising from Europe made agreement on an early NPT unlikely. The resultant Treaty of Tlatelolco was opened for signature in February 1967. Unlike the NPT, this only prohibited the acquisition, storage and deployment of nuclear weapons, rather than all nuclear devices, but it had its own regional verification system, which included provisions for challenge inspection, and a secretariat, OPANAL.

Two other elements of the draft Treaty did continue to generate significant problems throughout 1967: Article VI and related parts of the Preamble; and Articles VIII and X. The debate over Article VI and the Preamble was essentially over the commitments that would be made by the three nuclear weapon states negotiating the Treaty to engage in nuclear disarmament (neither China nor France were involved as, among other things, both regarded the negotiations to be aimed at them and their newly acquired nuclear weapon status). The debate over the Preamble centred around attempts by the NNWS, particularly India and Mexico, to set out a clear list of priority measures to be negotiated as part of the future nuclear disarmament process,

starting with a CTBT. The issue in relation to Article VI was how strong would be the commitment of the NWS to move towards nuclear disarmament; what other related objectives were they to seek to achieve; and what priority might be attached to these objectives. The result of the negotiations was that achievement of a CTBT was listed in the preamble, together with references to facilitating the cessation of the manufacture of nuclear weapons, the liquidation of their existing stockpiles and the elimination from national arsenals of nuclear weapons and their means of delivery. Article VI emerged as a commitment that:

Each of the Parties to the Treaty undertakes 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 under strict and effective international control.

This text gave no clear indication as to whether it was intended to be read as a listing of priorities, or whether each item had an equal priority and was not linked to the others in any way, while the NWS commitment was to 'negotiate in good faith' on such measures, rather than to agree or implement them. The debates over Articles VIII and X were almost entirely conducted among the allies of the US through bilateral consultations with the Federal Republic of Germany and Italy, and in NATO forums, rather than in the ENDC or between its co-chairmen, the US and USSR. The uncertain nuclear security situation that some of the US NNWS allies felt confronted them, a lack of belief on their part in the permanence of the existing US nuclear extended deterrence commitment, and a firm belief in the durability of the USSR nuclear threat made them unprepared to give up permanently the option of acquiring their own nuclear weapons. Although the draft treaty text contained provision for a state to give three months notice of withdrawal if '...extraordinary events, related to the subject matter of this Treaty, have jeopardised the supreme interests of its country...', this was not seen to provide for the case where gradual changes in the international environment and in perceptions of US policy made such withdrawal seem prudent. Thus Italy, in association with the Federal Republic of Germany, sought agreement on a text which would give all parties an unconditional right to withdraw from the Treaty at the end of a fixed period of time, through provisions which would require them to make a positive decision to continue. This would allow the parties to review their security situation at the end of the fixed period and decide whether to continue to accept the Treaty's constraints on acquiring nuclear weapons or abandon them.

Not unnaturally, the US and USSR were both opposed to inclusion of this element in the text, but the US was very sensitive to the need to meet some of these concerns if its allies, especially Italy, the Federal Republic of Germany and Japan, were to be persuaded to sign the draft treaty. The consequence was that by the time of a scheduled NATO summit at the end of 1967 a compromise arrangement had been negotiated consisting of two elements. One was the insertion into Article VIII of a paragraph mandating the three NWS, who were also the depositary governments for the treaty, to convene a conference to review the implementation of the treaty after five years, with the option that the parties could, if they chose, request the convening of further review conferences at five year intervals. The second was an addition to Article X of paragraph 2, which stated:

twenty-five years after the entry into force of the Treaty, a conference shall be convened to decide whether the treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods. This decision shall be taken by a majority of the Parties to the Treaty.

The intent of these elements was to offer the allies of the US the opportunity to review the security situation surrounding their non-possession of nuclear weapons every five years, and give them the possibility of arriving at a collective decision to terminate the Treaty after twenty-five years by agreeing that its duration should consist of a further short, fixed term or a series of renewable fixed periods.

Given the emphasis placed by the two co-chairmen of the ENDC on creating a treaty which would both meet their concerns and those of the allies who posed the most immediate threat of proliferation, it was not surprising that the non-aligned members of the ENDC found their concerns less than fully reflected in the final text of the Treaty. Although their right to develop nuclear energy for peaceful purposes was emphasised, and partial commitments were made on nuclear disarmament, no mention was made in the text of a further issue they

regarded as very significant, nuclear security assurances.

The core of their argument over this issue was that since both superpowers were providing their alliance partners with extended nuclear deterrence security guarantees, they should provide the non-aligned states with similar guarantees through the new treaty, until such time as nuclear disarmament made them irrelevant. Specifically, they were seeking negative assurances that the NWS would not attack them with nuclear weapons, and positive ones that they would go to their aid if attacked with such weapons.

Negative assurances would have undermined the existing NATO doctrine of being prepared to initiate the use of nuclear weapons against the territory of the NNWS allies of the USSR in a European war, however, and thus could not be contemplated by the US or its allies. Positive assurances were equally difficult to contemplate, as they implied an open-ended commitment to aid all NNWS parties in all circumstances. More specifically, they would place the US in a difficult situation if Israel *in extremis* threatened its neighbours with such weapons. A further issue was whether the assurances should only apply to NPT parties, or to all states. As a consequence, the treaty text which the two co-chairmen submitted to the ENDC on 11 March 1968 contained no reference to such assurances. This omission was one reason, among others, why India indicated that it was not prepared to sign this text. However, the three NWS did act on non-aligned concerns on this subject, particularly those of the Arab states, by passing through the UN Security Council on 19 June 1968 resolution 255, whereby the Security Council and 'above all its nuclear weapon State permanent members, would have to act in accordance with their obligations under the United Nations Charter' in the event of a nuclear attack upon a NNWS.

This resolution was passed a week after the co-chairmen's draft treaty,

with further amendments, had been passed to the UN General Assembly for its commendation. As a consequence of the Assembly passing a positive resolution on this matter, the NPT was opened for signature on July 1 1968, signed by the three depositary states on that day and came into force on 5 March 1970 when the required 40 states had ratified it.

The NPT that eventually emerged in 1968 had several unique characteristics. One was that it recognised the existence of two classes of state, NWS and NNWS. The former were defined as those which had exploded a nuclear device prior to 1 January 1967. The two classes of state had different rights and duties under the Treaty. Thus non-proliferation was tacitly accepted as a positive objective even if nuclear disarmament did not occur, despite the commitments by all states in Article VI to negotiate on the latter in good faith. A second was that the Treaty contained a delicate balance between three sets of commitments: the nuclear non-proliferation ones made by the NNWS; the nuclear disarmament ones made by the three NWS depositary states; and the rights given to the NNWS parties to develop or acquire all types of peaceful nuclear technology, in return for acceptance of IAEA safeguards over all fissile materials within their jurisdiction. This meant that it was open to any of its parties to place paramount emphasis on one of these aspects: nuclear non-proliferation, nuclear disarmament or the unconstrained right to develop nuclear energy applications for peaceful purposes. A third was that while it prohibited the acquisition of all types of nuclear explosives by NNWS, its negotiating history indicates that in 1968 it was not the intention of the US, the UK and their western allies that it should proscribe the stationing of a NWS's nuclear weapons on the soil of an NPT NNWS; to prohibit plans for their transfer in the event of war; or to prevent assistance by one NWS to another.

Section 3

A Short History of the NPT Review Process, 1970-2000

Introduction

The entry into force of the NPT marked a new departure for policies towards nuclear proliferation and non-proliferation: national policies of technology denial were being reinforced by international policies involving co-optation of, and collaboration with, potential proliferators. Although national technological denial activities and policies of persuading states not to proliferate through security guarantees and transfers of conventional arms continued, the NPT provided a vehicle through which states could make a binding legal commitment not to acquire nuclear weapons. This created a solid basis for action against them if, having made that commitment, they disregarded it. It also meant that the proliferation of nuclear weapons to an increasing number of states was no longer regarded as inevitable. The Treaty's effectiveness in both contexts was, however, crucially dependent upon the number of states which became parties.

At first, attempts to persuade states to ratify the Treaty focused upon those allies of the US who had been the focus for its negotiation, in particular the Federal Republic of Germany and Japan. By 1977 both had become parties, along with other states on the proliferation lists of the early 1960s such as Sweden, Switzerland and Australia. Attention then moved to bringing the large numbers of non-aligned states in Latin America, Africa and Southeast Asia into the Treaty. Numbers of parties slowly increased: 97 at the end of 1975; 114 at the end of 1980; 133 at the end of 1985 and 141 at the end of 1990. From 1990 onwards events moved swiftly, with China and France acceding as NWS in 1992, and two of the six contemporary 'suspect' nuclear-weapon states, South Africa and Argentina, in 1991 and 1995 respectively. Since Brazil had committed itself in 1994 to bring fully into force the regional NWFZ Treaty of Tlatelolco, this meant that it too had made a legal commitment not to acquire nuclear weapons. By 1995, only three states with nuclear capabilities, India, Israel and Pakistan, had made no legally-binding nuclear non-proliferation commitments.

The NPT was a framework treaty, and once it had entered into force efforts commenced to create agreements on the details of its implementation. The resulting collection of norms, rules, behaviours, institutions and arrangements is usually described as the nuclear non-proliferation regime.

NPT Safeguards

The first of the tasks facing the international community once the NPT had been signed was to negotiate and implement its detailed safeguarding or verification system. As the decision had been taken by the drafters of the Treaty that the IAEA should be responsible for verifying that nuclear materials in NPT NNWS were not being used for nuclear explosive purposes, Agency officials had to draft, and seek the agreement of the IAEA's Board of Governors to, the detailed arrangements for a new safeguarding system applicable to NNWS NPT parties. These arrangements focused upon accounting for the presence and use of all fissile material within the jurisdiction of the NNWS parties to the Treaty, and rested upon them declaring to the Agency their initial inventories of such materials, and subsequently any changes in their location and size due to transfers between and within states, operations of existing plants or the opening of new plants. This system, agreed in April 1971, was often termed INFCIRC/153, after the number of the IAEA information circular containing details of the model agreement between the IAEA and NPT NNWS. EURATOM states negotiated a collective agreement of this type, enabling the IAEA to safeguard activities within those states independently of EURATOM.

The INFCIRC/153 system was a product of difficult negotiation between those industrial NNWS which desired as little interference in the operation and cost of their nuclear power systems as possible, and those states attempting to create a verification system to give effective early warning of any diversion from a civil fuel cycle. One consequence was that its focus was on the misuse of declared materials and known facilities, rather than searching for undeclared materials and plants. Another was that most of its inspection effort was focused upon Canada, the Federal Republic of Germany and Japan, even though by the 1980s they appeared to be unlikely candidates as prospective nuclear proliferators. A third was that the NWS made 'voluntary offers' to place elements of their civil industry under IAEA safeguards in order to engage in an exercise of 'equality of misery' with industrial NNWS in shouldering the burden of accepting IAEA safeguards.

One consequence of these initial compromises became apparent in early 1991, when Agency activities mandated by the Security Council in Iraq started to uncover the full extent of that state's clandestine attempts to manufacture fissile material for nuclear weapons, despite its

NPT commitment not to do so. The result was that member states accepted that the Agency had to change some of its existing safeguarding procedures to enable it to handle future NPT renegades. This culminated in a set of proposals by the Agency Secretariat, initially labelled 93+2, for additional measures specifically geared to detecting undeclared activities and materials.

One key point in the process of strengthening the implementation of safeguards after 1991 was the recognition that although some desirable changes could be made to the existing system of 'comprehensive safeguards' to move its focus from the 'correctness' of a state's declaration to its 'completeness', others would require the negotiation of a protocol to the existing safeguards agreement to create the necessary legal authority for this. The changes that did not require further authority included voluntary reporting on all nuclear activities within a state; analysis of open source and other information concerning a state's nuclear activities; and the use of environmental sampling and remote monitoring equipment at sites declared to hold nuclear material. Changes that did require legal authority were the subject of extended negotiations, and it was not until May 1997, that the 'Model Additional Protocol' incorporating them was approved by the IAEA Board of Governors.

The basic concept behind the 93+2 activities was that the Agency should provide indirect, as well as direct, assurances that a state's material declarations were complete by auditing all activities within a state that could indicate the presence of undeclared materials. The Additional Protocol (known as INFCIRC/540) provided the authority for these indirect activities, which included information about mining and waste activities; comprehensive state declarations concerning all their nuclear activities; analysis of and comparisons between these state declarations and other sources of information available to the Agency, including open sources such as commercially acquired satellite images; environmental sampling covering the whole of a state's territory; and the right of access to other locations to confirm the status of decommissioned facilities and to resolve inconsistencies between a state's declarations and other information available to the Agency. States which had this in force would in future be known as being under 'integrated safeguards'. These would centre upon frequent reviews of individual country profiles to provide assurances that no evidence existed that a state was diverting declared nuclear materials or was in possession of undeclared nuclear material or engaged in undeclared activities. The stated aim of this new safeguards system was to offer the optimum combination of all safeguards measures and to achieve maximum effectiveness and efficiency within the available resources.

Export Controls

Although national export controls were not specifically mentioned in the text of the NPT, India's 'peaceful nuclear explosion' of 1974 stimulated supplier states into action on this matter. As the materials for the explosive device had been manufactured in a Canadian-supplied research reactor, attention became focused on two distinct issues: the conditions surrounding the export of nuclear materials and equipment to states that were not parties to the NPT; and whether technology holders should withhold all exports of nuclear equipment which might assist in the production of nuclear weapons if a state decided to proliferate.

The oil crisis of 1973, and the entry of France and the Federal Republic of Germany into the market for the export of nuclear technology, created a context of acute competition in an expanding and apparently lucrative market. This raised fears that fuel reprocessing and uranium enrichment plants, termed 'sensitive technologies' in this context, would be provided to NNWS customers to make offers of a vendor's technology more attractive. Moreover, some interpretations of the text of the NPT suggested that it did not prohibit exports of 'sensitive technologies' from NPT parties to either other NNWS parties to the Treaty or to non-parties. One consequence was that, within the US in particular, alarm started to be voiced that the normative and legal constraints contained in the Treaty would be inadequate to deal with the opportunities for proliferation presented by an expanding global nuclear industry, particularly as at that point relatively few of the states of contemporary non-proliferation concern had signed and ratified the NPT.

The consequences of this evolving situation were found in international efforts to co-ordinate export policies; attempts to agree on common guidelines for triggering IAEA safeguards on exports from NPT states; and US domestic legislation. In all cases, however, the main disagreements over these policies were between the US and its

industrialised allies.

The attempt to co-ordinate export policy, and in particular agree a common policy with France and the Federal Republic of Germany to prevent transfers of 'sensitive technologies', started with an East-West meeting of major technology suppliers in London in 1974. At French insistence, this and other initial meetings of this 'London Suppliers Club', later renamed the Nuclear Suppliers Group (NSG), were conducted without publicity, resulting in suspicions in some quarters, particularly among the non-aligned states who were not represented on the group, that this was a conspiracy to deny then the 'inalienable right' of access to all nuclear technology contained in the NPT text. After months of discussion, agreement was reached among participating states on a set of guidelines for nuclear transfers 'to any non-nuclear-weapon state for peaceful purposes'. They did this by defining 'an export trigger list and ...common criteria for technology transfers'. These guidelines were made public in February 1978 in the form of an IAEA information circular, INFCIRC/254.

The NSG guidelines listed those plants and their components which the adherents agreed should in future require a licence before a state would permit their export. Adherents were also expected to ensure that their export control legislation conformed to the guidelines. They also stated that suppliers 'should exercise restraint in the transfer of sensitive facilities, technology and weapons-usable materials'. The effect of the first was to make all nuclear transfers positive acts of state policy, thus highlighting the right of any state to refuse to sanction them if it believed they might be used to assist in nuclear proliferation. This, the suppliers argued, implemented their commitments under the NPT not to assist any state to proliferate. The effect of the second was to create a tacit understanding among all those in the NSG that in future they would refrain from exporting any reprocessing or enrichment technology. As a result, France halted its assistance in the construction of reprocessing plants to both Pakistan and South Korea, and the Federal Republic of Germany constrained its efforts to transfer enrichment and reprocessing technology to Brazil.

The NSG guidelines of 1978 represented the extent of consensus in the later 1970s among the technology supplying states. What they could not agree on was how to interpret Article III.2 of the Treaty text which stated that exports by NPT parties to non-parties were only to take place if 'subject to the safeguards required by this Article'. Canada and the US argued that in this context 'safeguards' meant INFCIRC/153 safeguards (i.e. safeguards on all nuclear materials within the recipient state). Others argued that it meant INFCIRC/66 safeguards on exported items alone.

Little further movement took place to revise or strengthen the NSG guidelines until 1991, among other reasons because of sensitivity to claims by non-aligned states that this was a discriminatory activity which breached the peaceful uses Article of the NPT. In February of that year, revelations concerning the activities of Iraq led the Netherlands to organise a meeting of adherents to the NSG guidelines to consider their revision. This resulted in the creation of several working groups to consider specific weaknesses and limitations illuminated by the activities of Iraq, especially its use of engineering firms in the Federal Republic of Germany and elsewhere with no previous connections with the nuclear industry to manufacture materials or components for use in their clandestine plants. In April 1992 agreement was reached amongst these adherents on significant amendments to the guidelines at a further meeting in Warsaw. These were published by the IAEA in July 1992 as INFCIRC/254/Rev.1/Pts.1 and 2.

The main consequences of this agreement were that guidelines were issued covering exports of items of technology having both nuclear and non-nuclear uses (dual-use items); NSG members agreed to consult with a central information point, provided by the Japanese mission to the IAEA in Vienna, before making such exports and to automatically reject export requests if another NSG state had recently done so; and all members agreed to make comprehensive IAEA safeguards a condition for supply to non-NPT parties [they already were in respect of NPT parties]. In addition, it was agreed that the NSG would meet annually in future, and make positive attempts to expand its membership.

The NSG's activities were conducted independently of the IAEA, but Article III of the NPT did give the Agency a specific task to perform in connection with national exports: determining which items and materials supplied to non-NPT parties should be subject to IAEA safeguards. The first version of this 'trigger list' of items, known as the

Zangger List, was published in September 1974, and updates were subsequently made on a regular basis.

These updates were consolidated into an amended document, INFCIRC/209/Rev.1 of November 1990, the content of which was very similar to the list of NSG guidelines items. However, in theory the two lists remained independent of each other, as they performed different functions.

The major area of contention between the Western allies in the later 1970s, however, was generated by an increased US desire for more positive policies to limit the nuclear proliferation dangers arising from the anticipated global expansion of nuclear power plants and their associated reprocessing and enrichment facilities. While the NSG guidelines went some way to meeting this need, US legislators believed that more action was needed. They introduced domestic legislation which both banned the reprocessing of nuclear fuel for civil purposes within the US and halted the national fast-breeder reactor (FBR) development programme which provided a justification for such activities. Their Nuclear Non-Proliferation Act of 1978 also mandated the administration to renegotiate the existing bi-lateral agreements for co-operation between the US and other states, and with EURATOM, to bring them into line with US policy. The consequence of these actions and of the election of President Carter in 1976, who had made taking new initiatives over nuclear non-proliferation a major campaign goal, was acute friction among the leading Western industrialised states over their nuclear energy and industrial policies.

The core disagreement was whether the types of civil nuclear power programmes being pursued by the allies of the US and the technologies involved, sometimes termed the 'plutonium economy', constituted too great a proliferation risk to be acceptable. No agreement could be reached on this divisive issue, and in October 1977 the International Fuel Cycle Evaluation (INFCE) was initiated. This was a technical and analytical study, based in Vienna, of the risks involved in the expanded nuclear power programmes. The hope was that this should arrive at some conclusive recommendations on the optimum fuel cycle when viewed from a non-proliferation perspective. By the time it reported in February 1980, however, the issue had become less pressing as the spate of new orders for nuclear power plants which had followed the 1973 oil crisis had peaked, and other issues were claiming the attention of the US government. However, the argument that all states should follow the lead the US had given in its domestic nuclear policies was to persist as an intermittent, if usually latent, source of disharmony with several of its major allies, such as Belgium, France, Japan and the UK, which had made significant investments in nuclear fuel cycles involving fuel reprocessing and plutonium recycling.

Disarmament

When the NPT was signed in 1968, multilateral negotiations to cap the nuclear arms race and reduce nuclear weapon inventories had lost most of the momentum they possessed in the late 1950s. However, a new route to these goals was starting to emerge: direct bilateral negotiations between the US and USSR. These led to the SALT I Treaty of 1972, limiting certain types of strategic armaments; a treaty to limit ballistic missile defences (the ABM Treaty of 1972); agreements to limit the yield of nuclear weapon test explosions (the Threshold Test-Ban Treaty of 1974) and underground nuclear explosions for peaceful purposes (the Peaceful Nuclear Explosions Treaty of 1976); a further treaty limiting strategic offensive arms (the SALT II Treaty of 1979); a treaty banning short- and intermediate-range nuclear missiles (the INF Treaty of 1987); and two treaties to reduce the numbers of strategic nuclear warheads and launchers deployed by the US and USSR (later the Russian Federation) (START I of 1991 and START II of 1993). In addition, from 1978 to 1980 there was a trilateral attempt by the United Kingdom, US and USSR to negotiate a CTBT, without any positive result.

One consequence of this activity was that while there was a continuing, if at times halting, effort from 1968 onwards to negotiate nuclear disarmament agreements between the two superpowers, with a focus on reducing numbers of delivery systems, two other trends could be discerned. One was that in the absence of limits on the numbers of nuclear warheads to be carried on individual delivery systems, the numbers of strategic warheads in the US and USSR arsenals increased from the date of signature of the NPT through to the early 1990s. The second was that all attempts to make progress in multilateral nuclear disarmament negotiations during this period were blocked, with no attempts to negotiate a FMCT and negotiations on a CTBT taking place for only a limited period of time.

With the end of the US-USSR ideological confrontation and the disintegration of the USSR in December 1991, the nuclear arms race between the US and USSR ceased to exist. One of the direct effects of these momentous changes was to stimulate both the US and first the USSR, and then the Russian Federation, to retire and then dismantle large elements of their nuclear arsenals through a series of unilateral decisions. Two other NNWS, France and the UK, also moved in a similar direction.

Another effect was to generate a new proliferation challenge as, although all its tactical nuclear weapons had been moved to the Russian Federation before the collapse of the USSR, strategic missiles and bombers, together with their nuclear warheads and bombs, remained operational in Belarus, Kazakhstan and the Ukraine. However, the arrangements in existence between the US and its allies when the NPT was signed provided a precedent for one state's nuclear weapons being stationed on another's territory. By 1994 arrangements had been made to move all these warheads to the Russian Federation, and for all the constituent elements of the USSR, other than the Russian Federation, to accede to the NPT as additional NNWS parties.

The end of the East-West ideological confrontation also had several other important effects. One was to assist in making possible a change in regime in South Africa. This in turn enabled it to dismantle its clandestine programme for the production of nuclear devices, join the NPT as a NNWS and then in 1993 reveal details of its former weapon programme. Another may have been to cause the regime in the Democratic Peoples' Republic of Korea (DPRK) to push ahead with the separation of weapon-usable plutonium from indigenously produced reactor fuel, leading to a long confrontation from 1992 onwards between it, the IAEA and the US during which the DPRK gave notice of its intention to withdraw from the NPT, and then 'suspended' that decision. The confrontation was eventually resolved through a framework agreement negotiated between the US and the DPRK in October 1994 under which two large power reactors were to be supplied to the DPRK. In return, the DPRK agreed to freeze all activities involving its indigenously constructed nuclear facilities, and eventually dismantle them.

A further effect was to open up the possibility of progress towards the disarmament objectives the non-aligned states had been seeking to achieve through the NPT. In January 1994 negotiations started in the Conference on Disarmament (CD) in Geneva on a CTBT, while a mandate was also agreed by the UN General Assembly for the negotiation of an FMCT. CTBT negotiations were completed in September 1996 with the signature of a Treaty. However, although the verification organisation associated with the Treaty, the CTBTO, had been brought into being in Vienna by 2000, the refusal of the US Senate to ratify the CTBT, along with several other states whose signature and ratification was necessary before it could come into force, meant that the existing informal moratorium on tests could not be given legal backing. Moreover, completion of negotiations on a CTBT did not lead to negotiations on an FMCT as had been planned, and since 1996 disagreement has persisted within the CD on the mandate and priority to be assigned to this measure, as against at least two other activities.

Security Assurances and NWFZ

In 1968 an attempt had been made by the three NPT depositary states, through Security Council resolution 255, to meet the demands of non-aligned states, particularly Egypt, for positive security assurances. However, the form in which they were offered (three national statements and a resolution which referred to them) was regarded by some states as no more than a restatement of commitments that already existed in the UN charter. Moreover, no attempt had been made at that point to provide NPT NNWS with collective negative security assurances. However, pressure for the provision of negative assurances continued and in 1978 they were provided, though in a form that was again regarded by states of the non-aligned movement as inadequate. In that year the first United Nations General Assembly Special Session on Disarmament (UNSSOD) was held, and in that context all five NWS made unilateral statements on negative security assurances. China's statement was an unconditional one; the French one was limited to states in NWFZ's; that of the USSR covered all states that renounced the production and acquisition of nuclear weapons and did not have them on their territories; while for the UK and the US, NNWS allied with a nuclear-weapon state were excluded from their commitment not to attack or threaten to attack a NNWS with nuclear weapons. At the next UNSSOD, in 1982, France provided NNWS with a broadly similar commitment to the UK and US.

As the numbers of non-aligned NNWS party to the NPT increased, so too did their pressure on the NWS to offer enhanced security assurances. Two states took the lead on this issue: Egypt on positive assurances and Nigeria on negative ones. Four types of enhancement were being sought: a common assurance given collectively by all the NWS, rather than a collection of differing unilateral statements; one that was in a legally binding form, rather than just a statement of intent (this implied either an independent agreement or treaty, or a protocol attached to the NPT); one applying to all states, but if this was not forthcoming to all NPT NNWS parties; and one that contained no reservations. However, despite this issue being on the agenda of the CD and being discussed actively at NPT review conferences, where both Egypt and Nigeria made positive proposals for such enhancements, it was not until 1995 that further changes were made to the existing multilateral security assurances.

The first change was that a new Security Council resolution, 984, was passed on 11 April 1995. This was similar to the 1968 one, in that it based itself on a series of national statements made in letters to the Secretary General on 5-6 April 1995, but it differed in encompassing both negative and positive assurances. Like previous assurances, they were not in treaty form, though some state representatives argued that Security Council Resolutions were legally binding. The second change was that although China maintained the unconditional form of its security assurance, the other four NWS modified their conditional assurances to bring them broadly into line with each other. Several obstacles were still perceived by the western NWS to stand in the way of an unconditional assurance. One was a reluctance to give up the element of deterrence through uncertainty inherent in conditional negative security assurances. A second was a concern that such a commitment would unnecessarily inhibit a NWS faced with a threat of use of chemical or biological weapons from a NNWS, and indeed might encourage such a threat.

The NWS had also been engaged in providing security assurances in two other contexts during this period. The first was that as part of the process of transferring to the Russian Federation the strategic nuclear weapons manufactured by the former USSR and still deployed in Belarus, Kazakhstan and the Ukraine. Nuclear security assurances were provided to all of them on 5 December 1994 by the Russian Federation, the UK and the US; on the same day by France to the Ukraine; and in February 1995 by China to Kazakhstan. These commitments were in line with those later contained in Security Council Resolution 984.

The second context was that of NWFZs. The first of the NWFZ treaties covering inhabited areas, the 1967 Treaty of Tlatelolco, contained two additional protocols that were open to signature by states outside the region. The first was for states with dependent territories within the zone: the second was for signature by the NWS. Signature of the first effectively prevented any stationing of nuclear weapons within the zone, while the second provided the states within the zone with unconditional security assurances. As all the NWS had signed this protocol by the end of 1979, one consequence was that the parties were given unconditional negative security assurances in binding legal form through this route. However, until the 1990s US policy was negative towards the creation of further NWFZs as, among other things, it regarded them as threatening limitations on its freedom to deploy nuclear weapons on a global basis. By 1993 the only additional group of states that had negotiated a similar zone were those in the South Pacific through their Treaty of Rarotonga of 1985. In this case, however, part of the motivation for negotiating the NWFZ was French nuclear testing in the area, and as a consequence France, the UK and the US refused to sign any of the three protocols to the Treaty, one of which provided the zonal states with unconditional negative security assurances.

With the end of the global East-West confrontation, the US started to take a more positive view of NWFZs, and as a consequence of this, and more importantly the change of regime in South Africa, rapid progress was made from 1993 onwards on the drafting of an African NWFZ treaty which would also offer unconditional negative security assurances to all those zonal states which chose to become parties to it. This work was completed in the summer of 1995, with the official signing ceremony for the document itself, known as the Treaty of Pelindaba, taking place in April 1996 in Cairo. By then a further NWFZ treaty, the Treaty of Bangkok, had been drafted and signed covering Southeast Asia, which also incorporated a protocol containing unconditional negative security assurances from the NWS. However, this protocol has yet to be signed by the NWS, for reasons connected

with some of the wording in the Treaty and its protocols.

NPT Review Conferences

Article VIII.3 of the NPT mandated that 'Five years after the entry into force of this Treaty, a conference of Parties to the Treaty shall be heldin order to review the operation of this Treaty...'. As a consequence, the first of these review conferences took place in Geneva in 1975. The precedents created by this conference were the basis for the procedural framework of future events of this type. Although it was a conference of the parties to the Treaty, not a UN one, it hired UN facilities and secretariat personnel for its meetings, as well as adopting rules of procedure based upon those of the UN. It set itself the task of reviewing the implementation of the NPT over the previous five years, rather than the text of the Treaty itself or the global nuclear proliferation and non-proliferation situation *per se*. It created a standard format for future conferences of starting 1-2 years before the event with several short sessions of a Preparatory Committee (PrepCom) tasked with identifying conference officers and agreeing the agenda and other procedural and administrative arrangements, and then moving on to the main meeting of four weeks duration.

The standard format used for the Review Conferences involved three phases of work by delegations. The first phase involved heads of delegation of participating state parties making plenary speeches, often drafted in capitals, outlining their initial positions on the issues they felt should be addressed by the Conference. In the second phase, the NPT text was divided between two (later three) Main Committees for detailed consideration of its implementation, and for the negotiation and drafting of a text reporting on the scope of a Committee's deliberations and its conclusions. The final phase involved attempts to integrate these Committee texts into a Final Declaration of the Conference with the aim of having it agreed by consensus. Formally, this task was assigned to the Drafting Committee, though it also involved other, more *ad-hoc*, groupings and meetings of representatives of groups of interested parties convened by the President of the Conference. Finally, a central structural element of the 1975 conference and its successors was the existence of three Cold War caucus groupings, similar to those found within the UN structure: the Western European and Others Group (WEOG); the Eastern Group; and a Neutral and Non-Aligned Movement (NAM) one.

In the years through to 1995, it became accepted as standard practice that review conferences would be held every five years, although the Treaty text specified that this was optional. The two main Committees were increased to three at the 1980 conference, *inter alia* to allow a representative of each of the caucus groups to chair a Main Committee. Also, it became the accepted practice to have the President nominated by the NAM. At later conferences, a new informal grouping based in Vienna started to emerge, sometimes called the 'white-angels', which consisted of smaller western states who wished to take a more active part in the proceedings than the caucus system allowed, and who performed a limited mediating role between those groups. However, despite the existence of the 'white angels', the main issues tended to be addressed on an inter-group basis. Finally, Presidents of specific Review Conferences tended to take a differing view of their role, ranging from a non-interventionist and neutral perspective at one end of the spectrum, to drafting the Final Declaration and attempting to impose it on the conference at the other. In addition, they made differential use of informal consultative groupings centred upon themselves, in one case making extensive use of the 'Friends of the President' and in another no discernable attempt to create and use such a group at all.

The outcomes of the conferences also differed significantly, though the content displayed great consistency despite the gradual increase of the parties attending. At the first conference in 1975 a short Final Declaration was agreed by consensus, partly as a consequence of the strong leadership displayed by the Swedish President. In 1980, under Iraqi presidency, no such document could be agreed. In 1985, with an Egyptian president operating an effective informal consultative system, a final declaration was agreed by consensus, even though differences of view on key issues were apparent within in. In 1990, under a Peruvian president, irreconcilable differences emerged that a last minute attempt at Presidential leadership could not overcome.

The content of the conference remained relatively static from 1975 through 1990, in part because of the structure of the Treaty itself and the differing perceptions that existed of its main objectives and significance. This was the only Treaty in which the NWS had made a legal commitment to negotiate on nuclear disarmament. The NAM

states regarded the NPT review conferences as major forums within which the NWS could be pressurised into moving forward on the disarmament agenda first articulated in the 1950s. As a consequence, action to negotiate a CTBT became the litmus test for them in evaluating compliance with the NPT by the NWS. It was also the most controversial issue under discussion and the one around which consensus was most likely to break down.

Other issues which had been prominent in the negotiation of the Treaty continued to have a significant role in the review conferences. Enhanced Security Assurances were demanded from the NWS, with little visible effect before 1995. Export Controls proved controversial, especially in 1980 when differences within the WEOG, and between members of it and the Eastern group on the one hand and members of the NAM group on the other, combined to make this a difficult issue to handle. IAEA safeguards also provided a fertile ground for limited disagreements, especially over whether INFCIRC/153 type arrangements should be a condition of supply to non-NPT parties. NWFZ and peaceful nuclear explosives, however, generated less friction, with the latter increasingly been seen as an obsolete element of the Treaty which was best ignored.

Insofar as accusations of non-compliance with, and non-implementation of, the non-proliferation articles of the Treaty were concerned, debates on these matters focused on what were euphemistically described as 'regional issues'. These were triggered by the concerns Arab states had over Israel's nuclear capabilities, and African states over those of South Africa. Both regional groups viewed NPT conferences as relevant forums to highlight and debate these issues, and ventilate accusations that the Western NWS were aiding Israel and South Africa's alleged military nuclear programmes. The existence of these two regional nuclear proliferation concerns also served to bind the NAM group of states together, as each regional group had a mutual interest in providing the other with support. However, due to the political make-up of the NAM group, these parties had little incentive to raise the issue of other potential proliferators, such as Argentina, Brazil, India and Pakistan, in NPT forums, despite attempts by certain WEOG states to widen these regional discussions on 'suspect states' to a global level. Finally, acute conflicts between Middle Eastern states also generated complications for the negotiation of a Final Declaration on at least two occasions. In 1985 Iran accused Iraq of attacks on its nuclear facilities, while in 1990 Iraq's attack on Kuwait generated significant complications, although the conference took place before the UN became aware of Iraq's clandestine nuclear weapon programme. Disagreements over the credentials of delegations also played a persistent, if minor, role in such conferences, in particular whether the Palestine Liberation Organisation (PLO) should be granted observer status.

By 1995 NPT review conferences were thus operating within a well-established procedural and substantive pattern, based largely on East-West structures and concerns. Yet the international security and political environment had changed significantly. The 1995 Review and Extension Conference therefore not only had to deal with the issue of the further duration of the Treaty created by the existence of Article X.2; it also had to operate in a substantive context where the proliferation problems were changing. As a consequence, some states wished to use the conference to confront those changes and challenges in a more effective manner than had been possible in the past, while others had a narrower and more regional agenda.

The 1995 NPT Review and Extension Conference (NPTREC)

The NPTREC was preceded by the normal series of PrepCom meetings, though in this case the final one did include some discussion of substantive issues. The objective of achieving agreement on an indefinite duration for the Treaty was the subject of intensive and systematic lobbying by the US, the EU states and other members of the Western Group and their associates. By contrast, members of the NAM were being urged to adopt a more limited duration, in the belief that this would generate periodic opportunities to force the NWS into political concessions over disarmament in exchange for further extensions of the Treaty. At the same time, South Africa had been developing ideas on how to move debates over disarmament away from political rhetoric and towards gaining commitment from the NWS to an incremental process of nuclear disarmament, while Canada had been working on plans for making all the parties more accountable for their actions.

The consequence of these activities, and of perceptions that ultimately it was the NNWS that had more to gain from the NPT in security terms

than the NWS, was a lengthy process of negotiations at the Conference on outcomes that would offer gains to most parties. These involved recognising that the majority of the parties favoured the Treaty having an indefinite duration; that a set of agreed *Principles and Objectives for Nuclear Non-Proliferation and Disarmament* should be accepted and implemented; and that *Strengthening of the Review Process for the Treaty* should be achieved through changes in the workings of the existing review process to provide for regular and more effective monitoring of the implementation of the *Principles*.

The overall objective of this unspoken bargain was seen by the NNWS involved in the negotiations as the achievement of 'permanence with accountability'. At a late stage in the negotiations, however, the Arab group of states indicated that they were dissatisfied with the outcome, which appeared to have deprived them of the option of threatening to terminate the Treaty if states parties failed to take collective action against Israel's alleged nuclear capabilities. This issue was eventually resolved by the three depositary states (the Russian Federation, the UK and the US) agreeing to sponsor a *Resolution on the Middle East* advocating *inter alia* that it be converted into a zone free of all weapons of mass destruction, and that all states in the region should be NPT parties and accept full-scope IAEA safeguards. Implicitly, the three depositaries could be argued to have committed themselves to implement this resolution. Thus the indefinite duration of the Treaty was paralleled by all states making commitments to specific substantive actions and to a 'strengthened' review process covering their implementation.

In parallel with the negotiations on the duration of the Treaty, the normal review proceedings had also been taking place, though the main focus for the heads of delegation until the final two days was the duration decision. However, no Final Declaration was forthcoming from the Conference, despite the DPRK and Iraq being in non-compliance with their safeguards agreements with the IAEA during the review period.

The Strengthened Review Process, 1997-1999

One effect of the decisions in 1995 was to create a set of expectations concerning the future implementation of the NPT regime. It also offered a set of general guidelines for the 'strengthened' review process, though its detailed modalities remained to be addressed. One key change was that sessions of the PrepCom for a Review Conference were to be held in each of the three years preceding it, rather than immediately prior to it. Each session was instructed to consider 'principles, objectives, and ways to promote the full implementation of the Treaty, as well as its universality'. In order to do this, it was to consider specific matters of substance, with particular reference to the *Principles and Objectives* decision document, including 'the determined pursuit by the nuclear weapon States of systematic and progressive efforts to reduce nuclear weapons globally.' The PrepCom was also instructed to take into account the *Resolution on the Middle East*.

The Chairman of the 1997 PrepCom session modelled its structure on that of the Review Conferences, with a Plenary and then three 'cluster' discussions, whose focus closely resembled that of their three Main Committees. An attempt was made at this first meeting to develop two documents: a consensus 'rolling text', which some believed was intended to form the basis for recommendations to the Review Conference, and a compendium of proposals made by states parties during the session. In addition, a recommendation was proposed that 'special time' should be allocated to three specific topics at the 1998 PrepCom session. Ultimately, a report was agreed on all these issues for transmission to the next session.

The 1998 PrepCom session implemented the proposal for 'special time', though this was allocated within the clusters rather than separate from them as some states were concerned, *inter alia*, that this would set a precedent for the creation at the Review Conference of the 'subsidiary bodies' which had been mentioned in the 1995 document. However, the session itself was beset by conflicts over the implementation of the *Resolution on the Middle East* and the powers of the PrepCom sessions, in particular whether their discussions and recommendations had to be directly relevant to the activities of the Review Conference or could also address current events. One consequence was that although very limited progress was made on updating the compendium of proposals and developing the "rolling text", the parties were unable to agree on a consensus report to the next session.

Consequently, the Chairman of the 1999 session was confronted with no formal guidelines from the previous sessions on how to generate recommendations to the Review Conference, or how to structure the

meeting. However, the parties rapidly agreed to an agenda and structure for the meeting, and also to the discussions on recommendations being based upon an amended version of the 1997/8 rolling text. Negotiations on the wording of the recommendations to the Review Conference all took place in plenary. No recommendations could be agreed either on substantive issues or the establishment of subsidiary bodies at the Review Conference, as

had been mandated by the 1995 document. One result was that the PrepCom did not comment on the nuclear tests of India and Pakistan that had taken place immediately following the 1998 PrepCom, or their self-declared nuclear status. Thus, although the sessions facilitated regular monitoring of the regime, they failed to achieve many of the objectives set for them in the 1995 documents, or produce consensus recommendations on urgent non-proliferation issues.

Section 4

The 2000 NPT Review Conference

The Negotiations

The 2000 RC opened positively, despite the failure of its PrepCom to produce the general and 'subsidiary body' recommendations mandated by the 1995 RC. Presidential consultations after the PrepCom had produced agreement on creating two 'subsidiary bodies', SBI on Disarmament within Main Committee I (MCI) and SBII on Regional Issues within Main Committee II (MCII). Initial plenary speeches by the US Secretary of State, the Foreign Minister of the Russian Federation and the Head of Delegation of China stated their national positions on National Missile Defence (NMD), the ABM Treaty and future nuclear policy firmly, but not inflexibly. The three MCs and the two SBs started work in the middle of the first week, after the United States and Egypt agreed that the *Resolution on the Middle East* would be handled as a regional question in SBII, whose remit also included Israel and Iraq, as well as India, Pakistan and the DPRK.

After private negotiations in the margins of the CD in Geneva, and then in New York, all five NWS agreed the text of a joint statement presented to the RC at the start of the second week. This signalled that the NWS were prepared to shelve their differences on nuclear weapon issues in the interests of a consensus Final Document. The second week of the Conference was spent collecting ideas in the MCs and SBs, and converting them into draft texts. At the end of that week the President convened an informal plenary on possible changes to the implementation of the strengthened review process, proposals ranging from the third PrepCom session alone being required to produce recommendations to its RC, though to the creation of an NPT Management Board to halving the time allocated to PrepCom sessions but convening an additional session in the year following a Review Conference.

Main Committee reports were scheduled for completion at the end of the third week, when the Drafting Committee was scheduled to integrate the texts into one or two integrated documents. As all five reports contained sections of non-agreed text, the chairs of four of the five bodies were asked to continue seeking clean texts, while the President took over the task of producing a clean MCI text. The constructive nature of this meeting encouraged the participants to engage in further private consultations.

Three types of activities then took place in parallel. One was that MCII and III met in open informal session to seek clean texts of their reports. The second was that the President convened a meeting of a group of 'representative countries' to identify agreed language for the text of the MCI report. This process was unsuccessful, and by mid-week had been abandoned. The third was private negotiations. One set of these was convened at the request of the President of the Conference to address disagreements over the text on regional issues being negotiated in SBII. It involved mainly its Canadian chairman, the US, Egypt, Iraq and some other Arab states.

Another set was between the NWS and the NAC, and was initiated by mutual agreement outside the UN building. This concentrated on trying to agree a forward-looking document on disarmament, and upon their existence being discovered was 'legitimised' by moving its location into the building. By the Wednesday evening these discussions had become stalemated, though a core document did exist. When they reconvened the next morning, the UK and the US indicated that they were prepared to accept the document as it stood if the NAC would do so. Russia voiced reservations over the core document, but then indicating that it was prepared to go along with the UK – US proposal. France then followed its lead. China remained unhappy about a paragraph on transparency that had been accepted by the other NWS and the NAC states, but eventually accepted the text.

Events then moved rapidly. Negotiations on a backward-looking text

between the NWS and the NAC, now joined by Indonesia, Germany and the Netherlands, continued throughout Thursday. Progress was slow, however, and it was agreed to reconvene early the next morning. When this meeting opened the UK proposed that those involved should agree to accept the text that then existed as the consensus backward-looking document on disarmament, with some balanced amendments and deletions. France indicated its support for this approach and the specific proposals made by the UK. South Africa confirmed that they were in broad agreement with the UK approach, but asked for a brief adjournment while the NAC consulted on the matter. This resulted in a counter-proposal for some modifications to the UK package. This was acceptable to France, Russia, the UK and the US. Both China and Indonesia, representing the NAM in this context, thus found themselves confronted with a *fait accompli*, which they eventually accepted. In this way, a consensus text had been created for both the forward- and backward-looking disarmament documents, the area that in the past had been the main stumbling-block to a consensus Final Document.

At this stage, it became clear that another roadblock existed before a consensus Final Document was possible: the inability of the US and Iraq to agree language on Iraq's non-compliance with the Treaty. Tortuous negotiations between the states involved and others, both in New York and capitals, eventually resulted in agreement on a text by mid-day on Saturday. The Drafting Committee then started its work of gaining agreement on the text of a Final Document, which was circulated to delegations. This included a text on recommended changes to the review process, which up to that point had neither been formally presented nor discussed by delegations. Disagreements still existed over the text of MCII's report, but the impetus to agree a text placed states under intense pressure to cut-out disputed language. This strategy enabled agreement to be reached on the Final Document late on the Saturday afternoon. It was then left to several states to indicate the areas where they dissented from the text they had formally accepted, and by this device enable a consensus Final Document to be agreed.

Substantive Issues and Products of the Conference

i. Universality

The 2000 RC named for the first time all those states (Cuba, India, Israel and Pakistan) which were non-parties to the Treaty. They were urged to accede to the NPT as NNWS, especially if they had unsafeguarded nuclear facilities. It also 'deplored' the Indian and Pakistan nuclear test explosions, declaring that 'such actions do not in any way confer a nuclear-weapon State status or any special status whatsoever'. India and Pakistan were called upon to implement UN Security Council resolution 1172 (1998), and to strengthen their nuclear export control legislation.

Elsewhere, universality continued to generate difficulties in the areas of technical co-operation with non-parties and the creation of reporting mechanisms. On the former, some NAM states wished to see a total cessation of all nuclear-related assistance to non-parties, even though this appeared contrary to the text of the Treaty. The result was that full scope (FSS) IAEA safeguards as a condition of material or equipment supply to such states was absent from the text. Although formal dialogues had been proposed with non-parties, no agreement was possible on this. However, all States Parties were requested to report to the President of the 2005 Review Conference and the Chairpersons of its PrepCom sessions on their efforts to realise the goals and objectives of the 1995 *Resolution on the Middle East*.

ii. Non-Proliferation

Two parties to the Treaty were the subject of allegations of non-compliance with Articles II and III of the NPT: the DPRK and Iraq. As

the former was absent, participants had little difficulty in agreeing a text noting that the IAEA had been unable to verify its initial declaration of nuclear material and thus could not conclude that no diversion of this material had occurred. The situation concerning Iraq was considerably more complicated in two respects: its delegates were in attendance and it had been certified by the IAEA to be non-compliant with its safeguards agreement prior to 1991. Agency reports had indicated that all clandestine activities had been accounted for, equipment destroyed and material removed, while a regular IAEA inspection had taken place in Iraq in early 2000 as required by its NPT safeguards agreement. This led Iraq to argue that it had been fully compliant with the Treaty since 1995, and that the UNSC resolutions were irrelevant in this context.

Some states, however, regarded it as unacceptable to either say nothing about Iraq, or to note that it was in possible non-compliance with its Treaty obligations, given its non-compliance with UNSC resolutions, including the non-implementation of the comprehensive system for monitoring WMD activities within Iraq. Their position was reinforced by a statement by an IAEA representative that 'in all the years between 1991 and 1999, the Agency has not been able to conclude that Iraq complied with its safeguards agreement'. Iraq rejected this statement. The compromise language eventually agreed noted that a regular inspection had been carried out in January 2000 of the material subject to safeguards and reaffirmed 'the importance of Iraq's full continuous cooperation with IAEA and compliance with its obligations'.

iii. Disarmament

The debate over disarmament centred upon whether the NWS should make an unconditional commitment to disarm, and the practical steps that should be taken in the next five years to further this objective. On the first issue, two statements were agreed. One was an 'unequivocal undertaking by the nuclear weapon States to accomplish the total elimination of their nuclear arsenals leading to nuclear disarmament, to which all States parties are committed under Article VI'. The second was a reaffirmation that 'the ultimate objective of the efforts of States in the disarmament process is general and complete disarmament under effective international control'. Those arguing that the statement was unconditional pointed to it being number six in a list of thirteen points, with the second statement at number eleven. Those arguing it was conditional upon general and complete disarmament pointed to the wording of Article VI, which talks about pursuing negotiations on 'nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control'. Their argument was that the latter was legally binding whereas the 2000 document was only politically binding. On the second issue, negotiations focused on how to enhance the 'action plan' contained in paragraphs 3 and 4 of the 1995 *Principles and Objectives* document. The forward-looking document that eventually emerged, usually termed 'the 13 steps', was much more comprehensive and wide ranging than that agreed in 1995. In particular, under the *chapeau* of 'steps leading to nuclear disarmament in a way that promotes international stability', it was agreed that the following should be implemented:

- further efforts by the NWS to reduce their nuclear arsenals unilaterally;
- Increased transparency by the NWS with regard to nuclear weapon capabilities and as a voluntary confidence building measure;
- the further reduction of non-strategic nuclear weapons;
- concrete agreed measures to further reduce the operational status of nuclear weapons systems;
- giving a diminishing role for nuclear weapons in security policies; and
- engaging "as soon as appropriate" all the NWS in the process leading to the total elimination of nuclear weapons.

What the RC did was to agree a practical and comprehensive nuclear disarmament agenda for its parties, containing a mixture of unilateral, bilateral and multilateral activities, in contrast to the Treaty's focus upon engaging in multilateral negotiations and agreements. It also implied a much less radical and more incremental vision of how to move towards nuclear disarmament than the 'time-bound framework' proposals which had been prominent before 2000. However, this 'action plan' often did not specify in detail the precise commitments that states parties had agreed to or what would be involved in their implementation.

The backward-looking element of the debate on the disarmament process concentrated on whether its pace had been satisfactory. In particular disagreement centred on how to characterise the numbers of

nuclear weapons remaining; on the proposal by the UN Secretary General for the convening of a major international conference on ways of eliminating nuclear dangers; on the significance of the 1996 ICJ advisory opinion on *Legality of the threat or use of nuclear weapons*; on the inability of the CD to initiate negotiations on an FMCT; and on the significance of the de-targeting declaration contained in the joint statement by the NWS.

iv. Nuclear-Weapon-Free Zones (NWFZ) and Security Assurances

The states parties found little difficulty agreeing language on the general desirability of additional NWFZ; on the need for relevant ratifications to bring existing treaties into full operation; and on welcoming and supporting efforts to set up a NWFZ in Central Asia. Difficulties did emerge, however, over Central Europe and the Middle East. Belarus wished to see positive language in the Final Document concerning their initiative on the establishment of a 'nuclear-weapon free space' in the former area, despite opposition to this from relevant states in the region. It continued to press this issue until the end of the Conference. Arab states wanted Israel to be urged by name to take the steps needed to implement a NWFZ in the Middle East, and this was resolved by restricting the naming of Israel in this context to the regional issues part of the Final Document.

Given that global security assurances to NPT parties had been one of the subjects allocated special time at the 1997-9 PrepCom sessions, and that both Myanmar in 1997 and South Africa in 1999 had made detailed proposals for Protocols to the NPT on this, it had been anticipated that it would be a major issue at the RC. However, the Final Document limited itself to 'calling upon the Preparatory Committee to make recommendations to the 2005 Review Conference on this issue'.

v. IAEA Safeguards

IAEA safeguards generated considerable controversy, both in their own right and because of their links to regional issues. The number of specific disagreements were in double figures, but were concentrated in a limited number of areas. One was the Additional Protocol to national safeguards agreements, which gave expanded powers to the IAEA safeguards system. Some states indicated that in future they wanted to make this Protocol an integral part of Agency safeguards, in particular in the context of exports to non-parties. Other wanted to continue to conduct trade with non-parties on the basis of safeguards being applied only to the exported items and materials. A further element in these debates was language directed at Israel by NAM countries calling for 'the total and complete prohibition' of the transfer of nuclear related equipment and materials, and of technical assistance, to non-parties. Other states argued that such acts would be contrary to the language of the Treaty. None of these differences were resolved.

Another set of disagreements concerned export guidelines. Language on both the work of the Zangger Committee and on the transparency seminars organised by the Nuclear Suppliers Group (NSG), was opposed by some NAM states as these bodies were regarded as barriers to economic development. Iran also sought to contest the right of the United States and others to refuse nuclear-related transfers to states if non-compliance with the Treaty had not been verified by the IAEA. Other contentious issues included proposals that all the NWS should cease the production of fissile material for nuclear explosive devices, and a favourable reference to the Convention on the Suppression of Acts of Nuclear Terrorism. The contested language on almost all of these issues was deleted in the final hours of the Conference.

vi. Peaceful Uses

Debates on this topic centred upon the implementation of the 'inalienable right' of states to enjoy the peaceful benefits of nuclear energy. Issues here included whether all states, not just States parties to the Treaty, should enjoy these benefits and the role of nuclear energy in sustainable development.

The Implications of the Conference

The successful conclusion of the 2000 RC was an extraordinary achievement. The fact that the NWS were prepared to put aside their differences in order to facilitate this result was interpreted by some as driven by their common interest in sending out a signal that they were united in sustaining the Treaty, the regime and global nuclear stability. For their part, the middle powers in the NAC also wanted positive signals to emerge from the Conference, and sought to concentrate on the areas where agreement, and thus momentum, was possible. As the products of the meeting started to be examined, however,

questions emerged about what had actually been agreed; what the commitments in the 'programme of action' contained in the Final Document actually meant; and how they could be implemented.

i. The Treaty and the Review Process

The messages for the Treaty and its review process contained in the Final Document of the 2000 RC were at best confusing. On the one hand, the outcome suggested that among the elements that assisted success were effective chairmanship of the MCs and SBs; a President who pursued a non-interventionist policy and left the resolution of key issues to the parties to the Treaty; and one who held his nerve in the end game and was not panicked into accepting a suboptimal result. On the other hand, the problems encountered over the issue of Iraq's non-compliance with the Treaty pointed to an inherent flaw in the nature of the rules of procedure for RCs: those accused of non-compliance with the Treaty cannot be denied their voting rights.

Only the absence of both the DPRK and Yugoslavia from the 2000 Conference may have prevented issues related to them playing a similar role to those concerning Iraq.

On a more specific level, some of the changes introduced into the review process in 1995 seemed to have been vindicated. The two SBs did focus attention on key issues at the Conference. What did not occur, however, was any conscious and visible updating of the 1995 *Principles and Objectives* document.

While the contents of this 1995 document were reaffirmed, the amendments to it were spread throughout the text. In addition, the contents of the 1995 Document were not used in any conscious way as yardsticks for assessing performance over the previous five years. As a result, the ties binding the ongoing review process to the 1995 document were partially cut, making it more open to change at future Review Conferences.

Perhaps more significantly, the PrepCom process was given little further guidance by the Final Document. While it appeared to signal acceptance of the failure of the modalities implemented in 1997, in particular the creation of a rolling text, it did little to replace them. Although the concept of the PrepComs preparing the ground for the RCs, other than in a very general way of educating participants about the issues, had not worked in 1997–99, the 2000 amendments offered little hope that this would occur in future.

They did not require the parties to arrive at any consensus recommendations for transmission from the first two PrepCom sessions to the third (their product was to be a factual summary of the discussions). However, the third was still expected to provide draft recommendations to a Review Conference, though some new reporting commitments on states parties in areas such as disarmament and the *Resolution on the Middle East* were created.

ii. The Regime Context

Four main challenges confronted the nuclear non-proliferation regime at the 2000 RC: its responses to the South Asian tests; its responses to the allegations of DPRK and Iraqi non-compliance; the Egyptian–US differences over the Middle East; and the more general issues of enhancing IAEA safeguards, implementing export controls on exports to non-parties, and environmental concerns. The Conference took a stand on the first of these issues. It deplored the test explosions; urged the two states to enter the NPT as NNWS; and called upon them to implement UNSC resolution 1172, including ratifying the CTBT and strengthening their nuclear export control legislation.

The challenge of non-compliance was one which could be met without undue difficulty in the case of the DPRK due to its absence from the proceedings. In the case of Iraq, the contentious nature of claims of Iraqi non-compliance after 1995, plus the presence of Iraqi representatives at the conference, made it much more difficult to craft a robust response.

The Egyptian–US differences over Israel and the *Resolution on the Middle East* proved a complex problem to resolve, but both states eventually succeeded in doing so through some astute diplomacy. For the first time in an NPT context, Israel was named in the Final Document, but not condemned, while all parties were requested to Report to the 2005 RC on the implementation of the *Resolution*.

The enhancement of IAEA safeguards was a subject that generated disappointment for some states, especially its failure to take a stronger stand on the need for parties to sign and implement Additional Protocols. Resistance was also encountered over the proposal that such Protocols might be regarded as part of the safeguards required for trade with non-parties. The Agency was thus given little help in moving towards an integrated safeguards system incorporating the rights it had gained through the Additional Protocol. In addition, it said little about strengthening export controls on transfers to non-NPT parties, as they were based on two informal 'coalitions of the willing' bodies, the Zangger Committee and the NSG.

During the conference, it also became apparent that concerns over the safety of maritime nuclear transport and the effects of climate change were becoming the prime interests of many of the small island states that are parties to the Treaty. Their interests in the increase in CO₂ emissions, which if uncontrolled might submerge their territories, interacted with the debate between the NAM pro-nuclear power and Western European anti-nuclear power interests in a way not seen at previous RCs.

iii. The Wider Disarmament and International Security Context

On the one hand the NWS were prepared to sideline their differences over START, NATO expansion, Iraq, Yugoslavia and NMD and TMD in order to achieve consensus on both a joint statement and a Final Document. This may have indicated the high priority they assigned to their collective interest in sustaining the NPT regime. They also agreed a much more extensive programme of action to implement nuclear disarmament than that drawn-up in 1995. Indeed, some might argue that the Final Document acted as a preparation, or even a substitute, for the long-heralded fourth UN Special Session on Disarmament, given its range of unilateral, bilateral and multilateral actions, and in the priority it gave to confidence building measures, arms reductions, verification and the irreversibility of disarmament activities.

iv. The Caucus Groups

The 2000 RC demonstrated that the politics of nuclear disarmament and non-proliferation had changed. While the three Cold-War caucus groups (NAM, Western and others and Eastern) appeared indispensable for allocating conference offices, one was a hollow shell and the others had predominantly information, rather than policy co-ordination, functions. As a consequence, regional and interest based groupings played a more significant role than before. In the case of the NAM, Arab and other regional groupings sought to pursue their specific interests through its consultative mechanisms, but agreed NAM positions were often coupled with contradictory regional and interest based ones.

Interest based regional and global groupings also abounded: the NATO-5; Finland and Sweden; the Vienna-based G-10; Australia and Japan; the South Pacific States (SOPAC) and the Caribbean Island States (CARICOM). It was the seven states of the NAC, however, which stood out as the completely new and highly significant player in this context. They formed an interest based coalition, seeking agreement on an expanded range of commitments on disarmament, while also pulling together the traditional groupings over this issue on language they had negotiated. To do this they had to negotiate with the loosely-linked grouping of the five NWS. It was in this context that the key issues of the forward-and backward-looking language on disarmament were resolved.

Section 5

The 2005 NPT Review Cycle

The First PrepCom Session, New York, 8-19 April 2002

This was Chaired by Ambassador Henrik Salander of Sweden at a time when the US had given notice of its withdrawal from the ABM Treaty.

Administrative and Procedural Matters in the 2002 Session

The meeting began with two days of opening statements from national delegations, and one half day from NGOs. The delegations then moved into informal discussions in closed sessions. These consisted of 11 half-day sessions of substantive discussions, divided into three sets of meetings on 'clusters' of issues and three on 'specific relevant issues'. It then concluded with a final formal plenary session attended by observers.

The 'cluster' discussions took place on the basis of the areas addressed by the three main committees at Review Conferences, with 'special time being allocated to:

- i) the implementation of nuclear disarmament;
- ii) regional issues, in particular implementation of the 1995 Resolution on the Middle East; and
- iii) safety and security of peaceful nuclear programmes.

The first week of the session saw no agreement on the indicative timetable, due to a refusal of France and the US to accept any version referring to the commitments on reporting contained in the disarmament and regional issues sections of the 2000 Final Document. This threatened to derail the session before it had started. The chairman then obtained agreement that the meeting would proceed on the basis of the existing draft timetable. A compromise was reached on this issue at the end of the first week, involving omitting specific reference to these activities.

The 2000 Review Conference Final Document had mandated that the 2002 PrepCom discussions were to be factually summarised and the results transmitted as a report to the next PrepCom session for further discussion. While it was accepted that production of this report was the responsibility of the Chairman, guidance was lacking on who should write the report; whether and how the Chairman would consult delegations on its wording; and whether there should be an attempt to have it accepted as a consensus document.

The chairman resolved these issues late in the session by indicating that he was proposing to issue the text as an annex to the formal report on the session on his authority alone, and that while he would consult informally on its substance it would not be open to negotiation or amendment. It was hoped this arrangement would avoid the conflicts over consensus wording that had occurred at the 1998 and 1999 PrepCom sessions.

This text was issued to delegations late on the penultimate evening of the session. Most of the NWS complained that the text was unbalanced in that it devoted too much space to disarmament issues, but there was general acceptance that the Chairman had made a reasonable effort to produce a 'factual summary', and all were prepared to accept that it should be 'transmitted to the next session for further discussion'.

Substantive Issues in the 2002 session

The 'discussions' at this session mainly focused upon providing information on the policies and attitudes of states parties towards a well-established and familiar range of topics.

What was new was the decision, heavily influenced by the events of 9/11, to schedule 'special time' for a discussion on the safety and security of the nuclear fuel cycle (i.e. nuclear terrorism).

The 66 statements delivered during the general debate, including those of the EU, the NAM and the NAC, mainly concentrated on re-stating familiar positions rather than offering new ideas. The NATO-5 struggled to come up with a common position paper and eventually gave up, with Germany putting forward its own paper focusing on non-strategic nuclear weapons.

i. Backtracking by the NWS

Although spokespersons for the United States argued that the Bush Administration was committed to nuclear disarmament, there was a widespread perception that its actions suggested otherwise, as did

leaked elements from its still classified Nuclear Posture Review (NPR). The US Information Paper on Article VI asserted that 'the United States was not developing new nuclear weapons' and had no plans to undertake such activities.

ii. Security Assurances

The 2000 NPT Review Conference had called upon the 2005 PrepCom to make recommendations to the Review Conference on the provision of legally binding security assurances by the five NWS. No discussion occurred on such recommendations in 2002, and this led to concerns over alleged backtracking by some of the NWS on their existing unilateral nuclear security assurances to NNWS though the NPT and NWFZ treaties.

These concerns were triggered by statements from UK and US government ministers and officials that their existing commitments not to use nuclear weapons against NNWS might be inoperative in certain circumstances.

iii. Non-compliance & Universality

Vigorous statements about Iraqi non-compliance with the NPT drew equally combative responses from Iraq but, in the absence of a DPRK delegation, there were no similar interchanges over their actions. Israel was also discussed, but given the unstable situation between itself, Palestine and some of the other Arab League states, and Egypt's role as the spokesman for the NAC, overt disagreements were avoided. Similarly concern was expressed over the delicate nuclear relationship between India and Pakistan, and the impact of the 'war on terrorism' upon this.

iv. IAEA Issues

Statements on IAEA safeguards mainly focused upon the need for those parties that had not done so to sign and implement an INFCIRC/153 safeguards agreement, and for those who had done so to sign and implement an Additional Protocol. However, some states in the Middle East made it clear that they regarded Israeli signature of an INFCIRC/153 type safeguards agreement as having a greater priority than the acceptance of the Additional Protocol by other states in the region. The discussions on peaceful uses covered several new NPT issues, not least those relating to nuclear and radiological terrorism and theft. This gave a new dimension to discussions on physical protection and the sea transportation of nuclear waste, as well as raising the profile of ideas for a Convention on Nuclear Terrorism.

v. Reporting

The reporting issue remained a source of friction throughout the meeting. It cloaked significant differences over how the disarmament provisions of the 2000 Final Document should be implemented, and the proposition that in 1995 the 'permanence' of the Treaty had been exchanged for 'accountability'. Some states, such as those in the NAC and Canada, clearly regarded reporting to a common format at every NPT PrepCom session or Review Conference as a new core NWS commitment, and thus considered it to be a substantive, rather than purely procedural, issue. For their part, the NWS understood their reporting obligations in much less specific terms, with no standard format and 'regular' not necessarily meaning 'at each meeting'.

The Second PrepCom Session, Geneva, 28 April-9 May 2003

This took place under the Chairmanship of Ambassador László Molnár of Hungary. At the start of the session Timor Leste/East Timor acceded to the Treaty and increased the number of parties to 189. Unlike 2003, no officials from non-party states attended as observers. The meeting took place in the context of several events which posed major challenges to the nuclear non-proliferation regime, including the DPRK's January 2003 NPT announcement of its intention to withdraw from the Treaty; U.S. allegations of undeclared Iranian nuclear activities; the December 2002 publication of the U.S. National Security Strategy; and the U.S.-led invasion of Iraq.

Administrative and Procedural Matters in the 2003 Session

Unlike 2002, the indicative timetable was adopted without any dissent at the start of the session. The 2003 session opened with the Hungarian Chairman using the procedural device of retaining the DPRK's

nameplate in his custody to prevent any debate on whether or not it had met the necessary legal conditions for withdrawal from the NPT. The meeting then proceeded as in 2002 with two days of opening statements from States Parties; a special half-day morning session for statements by NGOs; 12 half-days of closed informal sessions divided into three sets of 'cluster' discussions and three on 'specific relevant issues'; and a closing plenary session. In addition there were two half-day sessions allocated for procedural matters, including the final session dedicated to the consideration and adoption of the draft report from the 2003 session.

The 2002 session had created a precedent for the 2003 document, and The Chairman's factual summary was appended as a draft annex (annex II) to the formal report of the session. Its text borrowed heavily from that of 2002, with many paragraphs being identical or very similar. Close reading of the text revealed, however, an attempt to distinguish between issues on which there was some consensus and those where it was lacking. During the session, the U.S. prioritization of allegations of Iranian non-compliance and undeclared nuclear activity was reflected in several direct and indirect references to concerns voiced by states parties regarding Iranian nuclear activity. In contrast to 2002, the only direct reference to Iraq was in connection to progress in establishing a NWFZ in the Middle East.

Substantive issues in the 2003 session

The 2003 PrepCom session again served to provide information on the policies and attitudes of states parties towards a well-established range of issues, the majority of which had already been addressed by the first PrepCom session. However, there were some new issues, many of them generated by the Iran and DPRK nuclear programmes and their implications, and some arising from the discussions at the 2002 session.

i. Disarmament

Several NNWS expressed scepticism of the NWS intentions in the disarmament area, and in particular in implementing the '13 steps' agreed in 2000. The NWS for their part offered individual accounts of the progress that had been achieved in this direction in no uniform format, and argued that expecting progress in all areas was unrealistic.

The US and Russia highlighted their ratification of the Moscow Treaty/Treaty on Strategic Offensive Reductions (SORT), while the UK made a lunchtime presentation of their research on verification of nuclear weapon dismantling and decommissioning. France described the progress of its plans to dismantle its fissile material facilities and nuclear weapons testing site. China expressed support for general disarmament objectives, and criticized specific activities of other NWS, such as the development of low-yield nuclear weapons; failures to ratify the CTBT; and the weaponization of outer space.

Forceful statements on the lack of momentum in implementing disarmament commitments were made by members of the NAC who questioned the slow progress in this area. Although the Moscow Treaty was generally welcomed, it was argued that the proposed reductions in deployments and in operational status could not substitute for irreversible cuts in nuclear weapons. Several states urged the NWS to place all their 'excess military fissile material' under IAEA safeguards, and all 'relevant states' to desist from the production of fissile material for weapon-purposes, pending agreement on an FMCT. The NAM and others also stressed the need for the further expansion of education on disarmament and non-proliferation. The continued deployment and development of non-strategic nuclear weapons was an issue singled out for condemnation by an increased number of states compared with 2002, including Austria, Germany, the NAC states and the Netherlands.

ii. Security Assurances

As in the 2002 session, NNWS delegations such as those of Australia, Malaysia, Norway, the NAM, and several OPANAL states stressed the need for unconditional negative security assurances and no-first use policies. Malaysia, the NAM and Norway in particular reminded the session of the previous proposals for drafting a legal instrument and the recommendation that a subsidiary body be established within Main Committee I at the 2005 RC. The NAC states went further by submitting a working paper (*NPT/CONF.2005/PC.II/WP.11*) containing a detailed draft protocol on this subject, similar in most respects to that submitted by South Africa during the 1999 PrepCom (*NPT/CONF.2000/PC.III/9*).

iii. Non-compliance

While the issue of non-compliance concentrated on Iraq in 2002, in 2003 the focus of debate, and particularly US and other western states' allegations, had moved to the nuclear activities of Iran. In response, a member of the Iranian delegation argued that its nuclear program 'should be viewed on its own merit without the political burden of U.S.-Iran bilateral relations'. The DPRK situation was also a cause for great concern, but the absence of its delegation meant no dialogue was possible, and the focus was on urging it to either abandon its noncompliant activities and allow the IAEA back into the country or to rejoin the Treaty as a NNWS.

iv. Non-Proliferation

One major change visible in 2003 was that the focus of concern in the area of nuclear proliferation strategies, and their prevention, moved towards the issue of 'nuclear latency' (i.e. the slow increase in states who had comprehensive nuclear fuel cycles and could acquire the fissile materials for a nuclear weapon in a matter of months). This concern was triggered by weapon-relevant fuel cycle activities not being explicitly forbidden by the NPT. Further enhancing these concerns were the existence of nuclear activities of the DPRK and Iran that had not been reported to the IAEA, and the notice of withdrawal from the NPT given by the DPRK.

The result was a series of *ad hoc* proposals by a range of states for methods of addressing this situation. These included ways of making withdrawal from the treaty more difficult and onerous; addressing the issue of detecting weaponization; emphasizing that 'Article IV does not exist in a vacuum' (i.e. it is conditioned by Articles I and II); arguing for the development of new, proliferation resistant nuclear fuel cycles; developing clear mechanisms for the UN Security Council to deal with the situation; deeming it impossible for a state to withdraw from the NPT; creating new procedures for withdrawals to be handled immediately by NPT parties; and exploring the possibilities of regional or multinational fuel cycle facilities instead of national ones.

v. IAEA Issues

The 2003 PrepCom session witnessed a significant shift in opinion over the status of the Additional Protocol, as one of the several responses to the concerns over the 'latent' civil fuel-cycle route to nuclear weapons. The need for universal implementation of the Additional Protocol was accepted by almost all speakers. Indeed a range of parties promoted the idea that comprehensive safeguards coupled with the Additional Protocol should henceforth be adopted as the new IAEA safeguard standard, with Australia arguing that in order to increase transparency in export controls, all nuclear supply should be based on this standard.

One more general issue raised in parallel to Agency safeguards was the relationship between the promotional and safeguarding activities of the IAEA. The Chinese delegation, for example, called for the 'maintenance of the correct balance' in the Agency's activities between the promotion of international cooperation in the peaceful uses of nuclear energy and its safeguards functions. In addition, a range of statements confirmed the importance of timely and full contributions to the Agency's Technical Cooperation Fund.

vi. Safety and Security of Nuclear Material and Facilities

The perceived threat from nuclear terrorism resulted in great emphasis being placed on strengthening the safety and security of the nuclear material and facilities used in peaceful applications. Specifically, attention was focused on amending the Convention on the Physical Protection of Nuclear Material (CPPNM); strengthening the IAEA's International Physical Protection Service (IPPAS); and the further development of the IAEA's Code of Conduct on the Safety and Security of Radiological Sources, as well as the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Statements were also made by Australia, Japan and the United Kingdom concerning the maritime transport of nuclear material, which had relevance in both a safety and regional context.

vii. Export Controls

Export controls were linked into discussions on both the peaceful uses of nuclear energy and the prevention of terrorist access to fissile material, thus illustrating the polarisation of views on this subject. Norway called for the coordination of export control policies.

Australia praised the role of efficient export control organisations,

especially the work of the NSG and Zangger Committee, in denying unauthorized access to fissile material. Iran pointed out that unilaterally enforced export control regimes in contravention to the Treaty prevented developing states from accessing nuclear materials and equipment for peaceful purposes. Greece, on behalf of the EU, confirmed that EU technical cooperation was subject to recipient states' compliance with international obligations, including effective controls on re-export.

viii. Universality

With the accession of Cuba and Timor Leste (East Timor) to the Treaty, and the uncertainty over the DPRK's status, universality was an issue having both positive and negative aspects. Although the Chairman's custodial appropriation of the DPRK's nameplate served to limit debate on the issues surrounding its January 2003 withdrawal announcement, widespread concerns were expressed regarding its consequences. The accession of Israel was called for by a majority of delegations, most notably in connection with establishing a NWFZ in the Middle East and the implementation of the 1995 Resolution on the Middle East. Calls for all the remaining non-NPT states (India, Israel and Pakistan) to accede to the Treaty as NNWS continued to be articulated.

ix. NWFZ and Regional Issues

The importance of existing NWFZs was reiterated during the session. The accession of Cuba to the Treaty of Tlatelolco and the NPT was widely welcomed as a positive development, particularly as it meant the NWFZ in Latin America and the Caribbean had become universal. Various proposals supporting the establishment of a NWFZ in Central Asia were raised, as were calls to the NWS to sign the Protocol of the Bangkok Treaty (SEANWFZ).

Less obvious was the severing of the implicit linkage between condemnation of Iraq's activities and the naming of Israel that some regarded as underpinning the 2000 NPT Review Conference Final Document. This had been severed by the removal of the Iraqi political balancer to the naming and discussion of Israel.

x. Reporting & Transparency

Although not a central issue, procedural efforts to improve the implementation of the Treaty were one of the pervasive background issues during the session. Varied arguments were advanced for the need for greater transparency and accountability between NPT-parties, and methods of reporting remained a source of considerable friction between delegations, particularly over the implementation of the '13 practical disarmament steps' by NWS. Although inherently a procedural issue, the focus on it as a means of assessing disarmament implementation meant it was seen by a variety of states to have significant substantive implications. In addition, attempts were made at instituting an interactive exchange on substantive matters, particularly on disarmament issues.

The Third PrepCom Session, New York, 26 April-7 May 2004

This took place under the Chairmanship of Ambassador Sudjandnan Pamohadinigrat of Indonesia. The meeting was attended by representatives from 123 of the 189 States Parties to the Treaty: there were no official observers from the non-parties. The meeting took place following the emergence of a series of new challenges to the nuclear non-proliferation regime, including the gradual unveiling of the A.Q. Khan clandestine nuclear procurement network based in Pakistan, the implications of Libya's decision to dismantle its clandestine WMD programmes, and the admissions of major failures in assessments of intelligence by the US and other states over on alleged Iraqi WMD activities.

Administrative and Procedural Matters in the 2004 session

The 2004 session again opened with the Chairman announcing his decision to retain the DPRK's nameplate in his custody. Delegations began two days of general debate, followed by a half-day of presentations by representatives of NGOs. Further general debate then followed, as well as discussions and decisions on some of the procedural items necessary for the 2005 RevCon to start its work. This was followed by twelve meetings for substantive discussion, divided into three 'clusters' and three 'specific relevant issues' as in the previous two PrepCom sessions. After the opening of the cluster discussions in closed sessions as had been the rule since 1997, the Committee agreed on its fifth working day of to allow NGO observers to attend the remaining meetings as observers and receive documents from these sessions "without it constituting a precedent".

No agreement was possible on the indicative timetable for the session until its fourth working day. The delay resulted from disagreements over the allocation of special time for security assurances (which was seen by some as a precursor to this subject being allocated subsidiary body status in the RC). No decisions had to be made on this issue until the end of the first week when 'special time' sessions were scheduled to start. Agreement was eventually achieved by allocating special time to discussions on disarmament, regional issues (including discussions on the 1995 Middle East resolution) and safety and security of peaceful nuclear programmes, but not to security assurances.

The third session was unable to reach agreement on many of the procedural arrangements previously deemed necessary for a smooth start to a Review Conference, including its agenda and the provision of background documentation for delegations. This arose from the implicit linking of the wording of these procedural decisions by some delegations with several substantive issues, in particular the status of, and significance to be attached to, the 2000 Review Conference Final Document (and the "13 steps" therein). In addition, no recommendations on specific substantive matters were made by the PrepCom to the Review Conference as mandated in the decision on *Strengthening the Review Process for the Treaty* in 1995. Neither was there an agreed recommendation on the subsidiary bodies to be established within the Review Conference's Main Committees. Finally, the 2000 RC had mandated that recommendations should be made concerning legally binding security assurances: these were not forthcoming.

At the last meeting of the session, a short, largely administrative, final report was adopted. This made recommendations on those procedural issues that would allow planning for the 2005 Review Conference to proceed. These included its dates and venue; rules of procedure; the schedule of costs; and the Presidency and other conference officers.

The Chairman of the 2004 session on his own initiative produced a factual summary of the substantive debates, as in the two previous sessions. This text generated considerable criticism from some states, and no agreement was forthcoming to annex it to the report of the session as had happened in 2002 and 2003. Instead, a slightly amended version was issued as a working paper of the session on the Chairman's own authority (*WP.27*). The US delegation's criticisms of the original text were also included in the official records as a working paper (*WP.28*).

Substantive issues in the 2004 session

i. Disarmament

Nuclear disarmament and the perceived lack of progress on its implementation generated significant frictions during this session of the PrepCom. While the NWS collectively continued to defend their progress in implementation, the US and France attempted to exclude any prioritisation of the '13 practical steps' in recommendations to the Review Conference, and thus any recognition of these as commitments of indefinite duration. This stance contributed significantly to the lack of consensus on the final report and the Chairman's summary of the session.

Statements were made calling for the NWS to comply with their Article VI commitments, and implement more specific components of the '13 practical steps' towards disarmament, including, the CTBT, an FMCT, a subsidiary body on disarmament in the CD, enhanced transparency of nuclear-weapon activities, reductions in non-strategic nuclear weapons, and reporting of disarmament activities.

As in previous sessions, NNWS continued to stress the general importance of regular reporting by NWS, and the need to implement their specific commitment to submit specific and regular reports to each PrepCom and RevCon session on the implementation of the '13 practical steps'.

A working paper, submitted jointly by Belgium, The Netherlands and Norway called for the periodic submission by NWS of 'the aggregated number of warheads, delivery systems and stocks of fissile material for explosive purposes in their possession' (*WP.25*). The NAM argued that reporting by the NWSs should provide information on future intentions and developments relating to the '13 practical steps' (*WP.24*). Finally, Canada suggested that reporting on the progress on disarmament could be complemented by comprehensive reporting by all states on the implementation of the Treaty in its entirety (*WP.2*).

ii. Security Assurances

The PrepCom had been tasked with making recommendations to the 2005 RevCon on legally binding security assurances, but the issue proved so contentious that demands for the allocation of 'special time' to the subject in 2004 not only delayed the adoption of the session's timetable, but also resulted in no recommendations being made on this to the 2005 Review Conference. During the cluster 1 discussions, China, Cuba, Indonesia, Iran, Malaysia on behalf of the NAM, Mexico on behalf of the NAC, and Nigeria all called for strengthened security assurances. Whilst some statements called for the adoption of an unconditional, legally binding legal instrument, others stressed the need to establish a subsidiary body on this at the 2005 RC. Working papers were submitted by states parties, and on behalf of states parties, including the Arab League (WP.12), the ASEAN states (WP.21), China (WP.9), as well as a joint submission by Belgium, The Netherlands and Norway (WP.25). These papers all stressed the importance of security assurances in addressing the concerns of NNWS and in strengthening the regime.

iii. Non-proliferation

Non-compliance with the NPT's non-proliferation provisions was the United States' highest priority issue within the review process. Its delegation sought to describe and highlight a perceived 'crisis of NPT non-compliance', particularly in connection with Iran's nuclear activities. Many of the NNWS, while not disagreeing with the significance of this issue, also sought to argue that non-compliance with other Treaty provisions was equally damaging, notably the disarmament commitments by NWS.

Brazil, Japan, and Nigeria all commented on the importance of compliance with both non-proliferation and disarmament commitments, and reminded other States Parties that the success and credibility of the regime rested on the fundamental reciprocal bargain between the NWS and NNWS over these issues. The NNWSs and NWSs thus continued to define non-compliance in terms of their respective priorities and objectives, as in previous sessions of the PrepCom, illustrating this by reference to the Treaty resting on the three equal pillars or legs of non-proliferation, disarmament and access to peaceful uses.

The United States, by contrast, argued that compliance with Article II provisions should take precedence over all other issues and be the criteria for providing assistance with peaceful nuclear programs. It suggested that the standards for judging and enforcing non-compliance should be re-assessed and adjusted to prevent proliferation break-outs. In their working paper on the subject, it was argued that the pursuit and acquisition of nuclear weapons can and should be judged on intentions, without necessarily having evidence of the existence of complete nuclear weapons or devices, or even their components (WP.19). It also proposed that responses to non-compliance should be broadened, and not limited to just halting nuclear cooperation with a non-compliant state. Germany suggested the need for strengthening the role of the UN Security Council in judging and addressing acts of non-compliance and proposed the establishment of a 'Code of Conduct' with automatic provisions for responses to such acts, as well as a provision in supply agreements stating 'that the items delivered should remain under IAEA safeguards if the recipient state withdraws from the NPT' (WP.15).

iv. Peaceful uses

The other side of the coin of the US Approach to non-proliferation commitments was the insistence by many NNWS that they had an 'inalienable' right to develop and pursue peaceful uses of nuclear energy, and that this was equally important to the other two pillars of the NPT, namely non-proliferation and disarmament. Any heightened concern with non-proliferation should not be allowed to overshadow or downgrade the need to pursue disarmament and peaceful use obligations. China, for example, stated that 'non-proliferation efforts should not undermine the right of all countries, especially that of the developing countries to the peaceful uses of nuclear energy' (WP.7).

By contrast, the US and others presented proposals to limit nuclear enrichment and reprocessing facilities to NPT states parties 'in good standing already in possession of such facilities that are full-scale and functioning' (WP.19). France also outlined seven conditions which should be the combined criteria for the export of sensitive materials and equipment, including 'the highest standard of nuclear security and safety,' and 'an analysis of the stability of the country and the region' (WP.22).

v. IAEA issues

The balance to be struck between efforts to make universal the IAEA's comprehensive safeguards agreements and efforts to strengthen safeguards implementation among those with such agreements remained the core issue in this area. The need for universality of the Additional Protocol was emphasised, with a German Working Paper proposing that it become the "standard" for the implementation of Art. III, and thus a prerequisite for technical cooperation and assistance under Art. IV of the Treaty' (WP.16). Several States Parties argued for ratification of an Additional Protocol being a condition for all future nuclear transfers, with some suggesting this should be implemented by 2006. By contrast, the NAM state parties argued that the 'efforts towards achieving universality of comprehensive safeguards' should not 'wither in favor of pursuing additional measures and restrictions on non-nuclear weapon states' (WP.24).

States parties also stressed the importance of providing the IAEA with the political and financial support needed to carry out its verification duties. In addition, the US argued that states parties under investigation for non-compliance should not vote on their case in hearings before the Agency's Board of Governors or any Special Committee that might be created in future to consider compliance and verification matters (WP.19).

vi. Safety and Security of Nuclear Materials and Facilities

States parties emphasized the importance of strengthening and improving the physical protection measures applicable to nuclear material and facilities. Proposals in this area included enhanced national legislation on physical protection, improved border controls, supporting IAEA efforts in this area, and amending the Convention on the Physical Protection of Nuclear Material to extend its existing focus beyond nuclear material in transit. Japan also suggested that the adoption of the Additional Protocol by states parties should 'be promoted from the viewpoint of anti-terrorism' (WP.11). The US proposed that domestic legislation should be passed by all states in response to the provisions of UN Security Resolution 1540.

Its working paper specifically mentioned the implementation of the IAEA's Nuclear Security Action Plan, and the Code of Conduct on the Safety and Security of Radioactive Sources. For their part, the NAM expressed concerns over nuclear waste dumping and called for 'effective implementation of the Code of Practice on the International Transboundary Movement of Radioactive Waste of the IAEA' (WP.24).

vii. Universality

As in preceding sessions, the 2004 one witnessed general calls for the accession of India, Israel and Pakistan to the Treaty as NNWS. Also, that India and Pakistan should sign and ratify the CTBT; cease production of fissile material for nuclear weapons; place their fuel cycle programmes under IAEA safeguards; strengthen their national export controls; and start a dialogue to reduce regional tensions. Calls were also made for Israel to conclude a comprehensive safeguards agreement with the IAEA.

viii. NWFZ and Regional Issues

States parties confirmed the importance of the existing NWFZs and called for the ratifications needed for the entry into force of the African one, as well as the establishment of new NWFZs in Central Asia, South Asia, and the Middle East. Calls were also made by China, Japan, France, and the NAM for the establishment of a WMD FZ in the Middle East. Other proposals for this region included all of its states adhering to the CTBT; all accepting and implementing IAEA comprehensive safeguards agreements and their Additional Protocols; and accession by Israel to the NPT as a NNWS.

In its working paper, the League of Arab States called for states 'to refrain from entering into any agreement with ...[Israel] in the nuclear field' as well as for the submission by states parties of 'reports on the steps taken by them for the implementation of the 1995 resolution on the Middle East' (WP.12).

There were also various calls for Iran to provide full and transparent cooperation with the IAEA to resolve any outstanding non-compliance questions, as well as for its prompt ratification of the Additional Protocol.

The Libyan decision to abandon pursuit of WMD programmes was highlighted as the way forward for states such as the DPRK. As in 2003, states parties expressed their opposition to the DPRK's announcement of NPT withdrawal, and urged it to return to full compliance with its Treaty obligations. The need for continuation of the

Six-Party talks in order to achieve a peaceful resolution of frictions and a nuclear weapons free Korean peninsula through regional dialogue was also stressed.

ix. Export Controls

Many state parties continued to emphasise the importance of measures to strengthen existing nuclear export controls. In its working paper, Japan called for the explicit endorsement of the roles of the Nuclear Suppliers Group and the Zangger Committee at the Review Conference (in contrast to the lack of mention of them in the 2000 Final Document). Germany suggested the need for the IAEA 'to define the minimum standard of export controls in the nuclear field that is necessary to achieve the non-proliferation goals of the NPT'. It also proposed that the IAEA should have a larger role in assisting NPT member states to improve the effectiveness of their nuclear export control arrangements (WP.14). In its working paper, France outlined seven necessary conditions that should exist before sensitive nuclear materials and equipment were exported (WP.22). Finally, Germany suggested that in order to reaffirm the Treaty's provisions, supplier states could include in all their nuclear transfer agreements, clauses stating 'that the items delivered should remain under IAEA safeguards if the recipient state withdraws from the NPT' (WP.15).

The 2005 NPT Review Conference (May 2-27, 2005)

The seventh review conference (RevCon) of the NPT took place over 19 working days under the Presidency of Ambassador Sérgio de Queiroz Duarte of Brazil. The meeting was attended by 150 of the 188 States Parties to the Treaty.

Organisational and Procedural Matters at the 2005 Review Conference

The president first employed the tactic used in the RC PrepComs of taking custody of the DPRK's nameplate to limit discussion on its status. It was recognized that until the outstanding issues from the 2004 PrepCom (the Agenda and the number and focus of the subsidiary bodies) had been resolved or bypassed, the meetings of the MCs originally scheduled to start on the fourth working day of the RevCon could not proceed. However, no one sought to prevent the initial plenary session from starting. Meanwhile, informal discussions took place within the three regional groups, and between the three chairs of these groups, the chairs of the MCs, and the president over a formula to resolve the impasse inherited from 2004 over the wording of the agenda.

An initial proposal was to use an approach suggested at the end of the 2004 PrepCom session by its chair, but this was reportedly rejected by the Iranians, as it contained references to reviewing "recent" events. An attempt was then made to split the problem it into two components.

One involved gaining acceptance of the agenda discussed in 2004 but stripped of references to the products of the 1995 and 2000 Review Conferences, thus making it acceptable to the United States and France. The second component was for the president to make an explanatory statement for the summary record which would contain "coded language" reflecting the NAM position on the agenda.

Efforts then became focused on agreeing the wording of this presidential statement, with Egypt insisting initial drafts were inadequate because they contained no overt reference to the 2000 Final Document. In parallel, private exchanges started on whether state parties might make their initial MC statements informally to maximize the time available later for negotiating committee reports. These efforts failed to generate significant support at this stage as there could be no interpretation or summary record of such informal statements. Attention therefore switched to prolonging the initial plenary debate to provide a forum for the MC statements.

On the Friday of the first week, the president called a plenary meeting to try to break the deadlock. Following intensive and extensive discussions among the regional groups, the president indicated that he believed that agreement was now possible on the wording of both the agenda and his explanatory statement. However, when he put this proposition to the plenary, the Egyptian delegation objected to the wording of his statement and offered alternative language, to the consternation of those states who believed consensus had been reached on the matter. Consultations then had to start anew on a revised version of the two-component mechanism, in an atmosphere of friction and accusations of bad faith.

Three more working days were then expended on identifying a

mechanism and wording acceptable to all the states parties, but by Wednesday afternoon of the second week the president announced that agreement existed on an elaboration of the previous week's solution. This involved the president making his statement, followed by a statement from the Malaysian chair of the NAM group explaining its interpretation of his statement, followed by a similar statement from the UK chair of the Western European and Others Group (WEOG). This meant that in order to progress the two groups agreed to disagree in a manner that allowed both to claim that their position was the basis for the conference moving forward. However, in the Drafting Committee at the end of the Conference, it later became apparent that no clear understanding existed among the regional groups on how these statements were to be reflected in the conference report.

This development meant in practice, however, that there were still three hurdles, rather than four, preventing an immediate start on the work of the MCs. The remaining ones were procedural decisions on the wording of the allocation of work to the main committees; the numbers and subject matter of the subsidiary bodies and their parent MCs; and who should chair the MCs. Although the president tried to address these issues in sequence, their resolution proved possible only by treating them as a package. This process took another five working days, from the morning of Thursday, 12 May, to the evening of Wednesday, 18th. Much of this time was taken up with meetings of the regional groups, the General Committee and the president's "Executive Board" (i.e., the MC chairs, the regional chairs, and himself). The core problem was the allocation of subjects to the subsidiary bodies. Seven topics had been put forward as possible subjects: negative security assurances (NSAs), the 1995 Middle East Resolution, regional issues, disarmament, the NPT's institutional deficit, Article X and the process of withdrawal, and nuclear disarmament education.

Discussions soon focused on a proposal that only one subsidiary body should be attached to each main committee. SBI would cover both disarmament and NSAs; SBII would focus on regional issues (including the Middle East), as in 2000; while SBIII would focus on both Article X issues and the institutional deficit. The WEOG and Eastern Groups were largely supportive of this proposal, but the NAM argued for SBs on both disarmament and NSAs, the limitation of SBII to the Middle East Resolution, and no SB on Article X or the institutional deficit.

Discussions continued informally over the second weekend, but with little discernable result. Pressure was meanwhile building to find some way of starting the discussions normally undertaken through the MCs. Monday, 16 May continued to be occupied with inter- and intra-group consultations, and a planned meeting of the General Committee was again postponed until the next day. However, a short plenary meeting was convened in which Australia asked the president to timetable a further plenary on Tuesday, 16 May, to enable the 38 conference documents and 37 working papers then in existence to be introduced formally. This was seen as a means of moving into the type of debate that would normally take place in the MCs, especially as some of them appeared to be the text of their planned MC statements. This plenary duly took place, with five states introducing a range of papers, either on their own behalf or groups. At that point, Iran intervened to complain that the debate was extending into the areas normally covered by the MC debates and suggested this would make agreement to move forward into MC discussions impossible. The response of the president was that he was prepared to extend the plenary debate and allow additional states to speak the following day.

That afternoon, two documents that had been circulating informally since the previous Thursday were tabled, and all main groupings and states parties indicated they were reluctantly prepared to go along with the allocations contained within them. The need for continued consultations within and between elements of the NAM as a result of their internal disagreements resulted in no final decisions being made that day however. When the president opened the next scheduled plenary on Wednesday morning, he therefore announced that unless the issue of the MCs and SBs was resolved that day, he would offer the conference an alternative way forward as it could no longer hope to complete its work using the traditional procedures. At the same time he proposed an indicative timetable giving the majority of the remaining available time to the subsidiary bodies in line with the NAM negotiating position. When it became clear that this was not going to gain the agreement of the WEOG, he adjourned the meeting for further consultations.

The plenary then heard a series of statements nominally to introduce conference papers, but in most cases the statements originated from papers prepared for the MCs. This plenary was then adjourned to the

afternoon to hear more speakers. At the end of the afternoon the president announced that arrangements had been agreed on to permit the main committees and subsidiary bodies to start their work the next morning, Thursday, 18 May. The agreement involved accepting the documents first circulated five days previously on the allocation of work, with the president declaring his understanding that "each of the MCs will allocate within themselves time to their SBs in a balanced manner on the basis of the proportions used in the last conference". The titles of the subsidiary bodies were "Nuclear disarmament and negative security assurances" (SBI), "Regional issues, including with respect to the Middle East and implementation of the 1995 Middle East resolution" (SBII), and "Other provisions of the Treaty, including article X" (SBIII). The time remaining left these bodies with an impossibly short work period for an inherently difficult task: the two types of group combined were allocated 6 sessions each instead of the possible 17 that would have been available had the conference adhered to the original schedule.

Friction continued to be visible over how time was to be allocated within the subjects assigned to SBI and SBII. Draft reports from chairs of the MCs and SBs had to be circulated before all parties had stated their positions. Also, there was no time in some instances for any discussion before decisions were made on whether these reports were to be forwarded to the Drafting Committee. All draft reports had square brackets around either sections of text not agreed to or the whole text.

The schedule meant that the first report to be considered for forwarding to the Drafting Committee was that from MCII and SBII on the afternoon of Tuesday, 24 May. The chair of MCII reported that as it was not possible to produce consensus reports from either body, and as two states (Egypt and Iran) had made it clear they would allow only consensus texts to go forward, he had no option but to send a short technical report to the Drafting Committee with no texts attached even though the precedent from all previous Review Conferences was to allow such texts to be passed through to the final stages of the drafting process.

On Wednesday morning the reports from MCI and SBI came up for final consideration in parallel with those from MCIII and SBIII. The former received different treatment than that given to MCII and SBII.

Those states that had opposed non-consensus texts from MCII being sent to the Drafting Committee were prepared to allow them to go forward from MCI and SBI, as they were in favour of texts on

disarmament and security assurances being given a prominent status in the conference report. This, however, required agreement on the MCI report before that of MCIII. The text of MCI was indeed agreed to first, and there was no objection to the attachment of non-consensus texts to it.

In the case of MCIII and SBIII, it was argued that this text should not go forward as there was no consensus over it, due in part to the Egyptian tactic of tabling at a late stage a paper on another "provision" of the treaty. The MCIII text was much closer to a consensus document than any of the others, as it was strongly supported by the European Union (EU) and many industrialized states, though opposed by Iran and Egypt. However, the chair was prevented from trying to push the text through the committee by a last-minute objection from the United States. The only texts on substance that were sent forward to the Drafting Committee were thus those attached to the technical report from MCI/SBI.

As the Drafting Committee could use only the products from the committees to produce a Final Document, the actions of those who opposed any non-consensus texts going forward effectively made impossible any written substantive product from the conference. The only option that remained was for the president to put a document of his own to the conference. This had been mooted for some time, but he chose not to do so, no doubt influenced by indications from a representative of a Middle Eastern state at a Track II meeting the previous weekend that even the blandest of final declaratory statements was likely to be opposed.

On Friday, 27 May 2005 the conference agreed on a technical report on its activities, with the Main Committee I/Subsidiary Body I non-consensus drafts attached, whilst a range of states seized the occasion to make statements reflecting on what had happened. The two most perceptive statements from the perspective of the NPT Review Process were perhaps those of Canada and Chile. Canada complained that short-term interests had overridden long-term concerns, and Chile that the concept of arriving at a product only by consensus made a positive outcome from NPT Review Conferences a near impossibility. Two more contentious statements from Iran and the United States seemed to suggest that even if more time had been available, inter-state friction would have made a consensus product difficult to obtain.

Section 6 The 2010 NPT Review Cycle

The First PrepCom Session, Vienna, April 30-May 11 2007

In 2007, the NPT PrepCom sessions moved to Vienna for the first time, under the chairmanship of Ambassador Yukio Amano of Japan. The session took place against the background of an unproductive 2005 NPT Review Conference, and the set of procedural/substantive problems it had never fully resolved. These included whether the so-called '13 practical steps' toward disarmament contained in the 2000 Final Document were commitments or merely targets, and thus what would be the status of any agreements recorded in such documents in future.

Administrative and Procedural Matters at the 2007 PrepCom Session

The chairman had made extensive efforts to agree the agenda for the meeting in advance, but these were complicated by ongoing negotiations and IAEA/UNSC activities to constrain Iran's indigenous nuclear enrichment and reactor programmes. However, when the meeting started the chairman appeared to believe he had agreement on his proposed agenda from all of the main players in the 2005 debates. This draft agenda had inclusive wording in its para.6, which read:

Preparatory work for the review of the operation of the Treaty in accordance with article VIII, paragraph 3 of the Treaty, in particular consideration of principles, objectives and ways to promote the full implementation of the Treaty, as well as its universality, including specific matters of substance related to the implementation of the Treaty and Decisions 1 and 2, as well as the resolution on the Middle East adopted in 1995, and the outcomes of the 1975, 1985,

2000 and 2005 Review Conferences, including developments affecting the operation and purposes of the Treaty, and thereby considering approaches and measures to realize its purpose, reaffirming the need for full compliance with the Treaty.

This formula satisfied Egyptian wishes to highlight the issue of Israel's reputed nuclear weapon programme. It also covered the 13 practical disarmament steps of 2000 and at the same time accommodated US and French wishes not to see implementation of these steps singled out for special attention. It also allowed for discussions of current non-proliferation issues, including the situation over Iran and the DPRK.

During the chairman's consultations, Iran had voiced objections to the elements in this agenda item relating to 'developments affecting the operation of the Treaty' and 'the reaffirmation of the need for full compliance with the Treaty'. However, there appears to have been some uncertainty over the strength and implications of its objections. After the initial formalities to start the session, the chairman opened the floor to general plenary statements. At the end of the afternoon plenary session, he moved to have the PrepCom adopt its draft agenda. The Iranian delegation responded by proposing an amendment to remove what they regarded as its anti-Iranian focus. This involved changing the final phrase from 'reaffirming the need for full compliance with the Treaty' to 'reaffirming the need for full compliance with all articles of the Treaty', wording taken from the agenda agreed for the 2002-4 PrepCom cycle. This move generated considerable confusion among delegations over whether the text Iran was referring to was from the 2002 PrepCom or the 2005 Review Conference, as the reference given was to a document with a 2005 number. At least one key delegation regarded the two formulations as having the same meaning. Others were not prepared to accept any changes to the chairman's

compromise agenda which had taken many weeks to negotiate. The chairman therefore adjourned discussion of the issue to a later date to allow for further consultations.

The plenary sessions continued (as in 2005) with NGO statements being made on the Wednesday. The chairman held bilateral meetings with interested parties to seek a resolution of the agenda issue. By Thursday the general debate had concluded, and as in 2005 some delegations were discussing moving forward with the cluster discussions, which had been due to start on the Wednesday, within the plenary meetings. Since Iran appeared alone in its wish to amend the draft agenda, the caucus groups had to confront the need to balance supporting the chairman's agenda against the uncertain consequences of not starting the cluster debates. While support for the chairman's position remained solid, pressure for starting the cluster sessions in the plenary continued to rise, as concerns grew that Iran sought to prevent any further action during the session in order to avoid the meeting making any adverse statements about its nuclear policies.

A plenary was eventually convened at 1800 on Friday 4 May to see if it was possible to agree the agenda and start work on the clusters the following Monday. Iran had not changed its position. South Africa then proposed that the PrepCom should keep the chairman's language for the agenda, but adopt a decision that it understood the contested language to mean 'full compliance with all the provisions of the Treaty'. At the same time Cuba, on behalf of the NAM, indicated that they were not prepared to proceed with the substantive debate without agreement on the agenda, while Algeria raised the issue of how precisely the South African proposal would be documented. At that stage the session had to be adjourned for practical reasons.

When participants reassembled on the Monday morning, many delegations were debating at what point the time remaining would make it impossible to have a useful exchange of views, and whether an early closure of the session was becoming inevitable. Even if there was a rapid agreement on the agenda, there might then be further delay before a schedule of work could be agreed. As a consequence, delegations started to turn their attention to converting their planned cluster speeches into working papers to record their views in the formal report from the meeting.

The PrepCom reconvened in plenary on the Monday afternoon, and took a decision on the dates and venue for the next session, thus guaranteeing this event would occur. The chairman then stated that he was adjourning the plenary until the next morning as one state (Iran) was waiting for instructions from its capital. Informal discussions on Monday afternoon therefore focussed on how to handle an anticipated choice between having too little time for effective cluster discussions and closing the session early without them.

Late on the Tuesday morning, the chairman re-opened the plenary session, and proposed that the meeting accept the South African proposal, now circulated in written form as NPT/CONF.2010/PC/1/1, and also took note of an indicative timetable (NPT/CONF.2010/PC/2). The latter allocated one 3hr session for each of the three cluster and three special time sessions. The special time items were to be on the topics covered in the subsidiary bodies established for the 2005 RC. Iran asked for the floor and complained about the lack of effective consultations with the chairman; the inflexibility shown by other delegations; the continued necessity for the consensus rule and the lack of participation by one delegation (US) in the discussions over the agenda. Its representative then stated that in a display of good will, his government could accept the agenda if it included the footnote to item 6 of the provisional agenda that had been proposed by South Africa. The meeting then accepted the chairman's proposed agenda and noted his revised indicative timetable.

Discussions on the implementation of Article VI started on the Tuesday afternoon in Cluster 1. On Wednesday morning a focussed debate took place on security assurances and disarmament in the special time session, followed in the afternoon by one on Article III IAEA safeguarding issues in Cluster 2. Thursday started with the special time session on regional issues, including the 1995 resolution on the Middle East. This mainly focussed on the Six-Party Talks and the DPRK; Israel and a NWFZ in the Middle East; and Iran. It was followed by a Cluster 3 Article IV debate on peaceful uses, export control mechanisms and nuclear fuel supply assurances. The cluster debates then concluded on the Friday morning with a session on 'other provisions of the Treaty including Article X', which addressed issues connected to withdrawal from the Treaty, plus arguments for and against making amendments to the way the review cycle was organised and the need for stronger

and more permanent institutional mechanisms, including a thorough review in 2010 of chairing arrangements.

These three days of cluster debates proved to be very constructive in a number of ways. Those present were determined to capitalise on the collective will and positive atmosphere generated by the long-drawn out process of agreeing the agenda. As suggested by the chairman, speeches remained within the time limits of 5 minutes for states and 8 minutes for groups. This resulted in 30-36 speeches being delivered at each session, and in some cases left time at the end for spontaneous and unprepared interactions between states. It also made for sharper and more focussed debates. Due to the earlier delays the number of working papers reached the record of 74 (including one for the first time from Palestine), greatly increasing the costs of the conference as many had to be sent to New York for translation.

The chairman was left with 75 minutes on Friday to finalise his factual summary of the proceedings, and distribute it to delegations. This proved to be an incisive, lengthy and balanced document. As was expected, many complained about in detail, but almost all states were prepared to support it given their collective determination to reverse the lack of visible agreement from the 2005 Review Conference, and the problems over the agenda for the 2010 RevCon sessions. Caucus meetings were then held over how to handle both the substance of the report and the formal procedure for handing it on to the 2008 session. Some states had difficulty with annexing the summary to the formal report on the meeting as had happened in 2002 and 2003, but they were prepared to give it the status of a working paper from the conference, as had happened in 2004. Iran, however, was not prepared to accept this compromise. This situation threatened to prevent any product emerging from the session, including the recording of the agreement on the future agenda. After some hours of argument and both bilateral and multilateral meetings between the chairman and key states and caucus group chairmen, Iran was persuaded to go along with the consensus view and not oppose acceptance of a formal report containing the future agenda and to list the chairman's factual summary as a working paper of the PrepCom session. As a result, at 1845 on Friday May 11, the final plenary met for a short time and agreed the formal report from the session.

Substantive issues at the 2007 PrepCom Session

See Chairman's Working Paper Section B below.

The Second PrepCom Session, Geneva, April 28-May 9 2008

This session was chaired by Ambassador Volodymyr Yelchenko of Ukraine. The political context included the continued stand-off between Iran and other parties over its enrichment programme and the existence of an alleged Syrian reactor built with DPRK assistance that had been attacked from the air by Israel.

Administrative and Procedural Matters at the 2008 PrepCom Session

As the Agenda for this PrepCom session had been agreed in 2007, and no state sought to re-open the issues which had arisen over this in 2005 and 2007, there were no procedural delays in moving from the plenary to the cluster discussions. The result was that an indicative timetable was adopted of: three sessions for general debate; one session for NGOs to address the PrepCom; two sessions to debate "cluster 1" issues; two sessions to address nuclear disarmament and security assurances; two sessions on "cluster 2" issues (i.e. IAEA safeguards and nuclear weapon free zones); two sessions on Regional issues including the resolution on a Middle East Nuclear Weapon Free Zone; two sessions for "cluster 3" issues including nuclear energy for peaceful purposes and its safety and security; and two final sessions on "other provisions of the treaty including article X" and the right to withdraw from the treaty, and issues such as UN Security Council Resolution 1540. As the conference did not meet on Thursday May 1 (a public holiday), this meant that discussions were scheduled to finish on Thursday May 8, with a final day to agree the formal report on Friday 9th.

The chairman's uncontested decision to operate under the same speaking rules as in 2007, namely 5 minutes for individual statements by states party, both maximised the time available for interactive debate and still resulted in the meeting finishing its detailed work by the middle of the second week, well ahead of its indicative timetable. The inability of delegations to use more effectively the time made available for interactive discussions as against formal statements disappointed those delegations which had since 1995 sought to encourage this type

of activity. The time made available did however enable a number of key procedural decisions to be made including the location and date of the 2009 PrepCom (New York from May 4 - May 15, 2009); its chairman (Ambassador Boniface Guwa Chidyausiki of Zimbabwe); the location (New York) and date (April 26 - May 21, 2010) of the 8th NPT Review Conference; and the Secretary-General of the Conference. Questions were also raised regarding how the presidency of the 2015 RC should be decided though there was no challenge to the NAM nominating the president from one of its regional groups in 2010. A number of NAM states voiced concerns about the United States withholding or delaying visas required by diplomats for participation in these meetings, while the cumulative problems arising from states parties not paying their contributions to NPT, resulted in a request that the UN provide a report on outstanding contributions.

Although the atmosphere of the meeting had been relatively low key and harmonious, in contrast to 2007, the soundings taken by the chairman indicated that he was unlikely to gain a consensus for his factual summary to be annexed to the formal report of the meeting as had happened in 2002 and 2003. He therefore decided to issue his summary as a working paper. The meeting ended with the chairman steering the PrepCom through its formal report paragraph by paragraph. He then opened a discussion on the working paper that contained his factual summary. This covered the main articles of the NPT and in its structure and language built on the 2007 chairman's paper. It attempted to represent the views of the parties in a balanced manner, and as had become normal at such meetings, a number of states made final statements highlighting their disagreements with it.

Substantive issues at the 2008 PrepCom Session

See Chairman's Working Paper Section B below

The Third PrepCom Session, New York, May 4-15 2009

The session was chaired by Ambassador Boniface G. Chidyausiku of Zimbabwe. The political context included the continued stand-off between Iran and other parties over its enrichment programme and the ongoing attempts by the IAEA to clarify whether a building in Syria destroyed by Israeli military action had contained an undeclared nuclear reactor. Above all, the entry into office of Obama as US President and his April 5 Prague speech about nuclear disarmament was seen to herald a new US willingness to engage constructively on this issue, thus improving the atmospherics of the meeting.

Administrative and procedural matters at the 2009 PrepCom Session

To the surprise of many, the Chair's proposals for the Agenda of the 2010 Review Conference and on specific issues to be addressed by Main Committees I, II and III of the RevCon were agreed on the third day of the meeting, thus guaranteeing that there would be no repeat of the prolonged lack of agreement on these issues and the delay in starting committee discussions experienced by the 2005 RevCon. Furthermore, the states parties reached agreement on the dates of the RevCon (3-28 May 2010), background documentation to be commissioned by the UN, IAEA, and other organisations for it, and its draft rules of procedure expeditiously, as well as nominating the president (Ambassador Libran N. Cabactulan of the Philippines) and chairs for the conference and its committees for recommendation to the RevCon. The only procedural issues left undecided were the subject matter of the Subsidiary Bodies within the three Main Committees, and whether there would be a single Final Document from the conference or more than one.

States parties also engaged in discussions in the PrepCom's three "clusters" and the special time within them, on the basis of the rule introduced in 2007 that no delegation should speak for more than five minutes. These focussed and fast-moving discussions enabled the Chair to circulate towards the end of the first week a set of draft substantive recommendations to be sent to the RevCon. During the second week the Chair engaged in discussions on these among interested parties, which led to a revised version being issued in the middle of that week. After further debate requests were made to the Chair that he produce a final version to see if it was possible for the PrepCom to accomplish something which none of its predecessors since 1995 had managed to achieve: sending a consensus set of recommendations to the RevCon. However, when this third version was opened to debate on the final morning of the session it rapidly became clear that some parties wished for further textual changes. At that point the Chair judged that no further progress was possible, and moved to gain agreement on the formal report from the meeting and close the session.

Substantive issues at the 2009 PrepCom Session

See the three versions of the Draft Recommendations to the 2010 NPT Review Conference in *Part II, Section B (Final Draft Version of Chair's Recommendations to the 2010 NPT Review Conference; Draft Recommendations to the Review Conference – Revision 1; and Draft Recommendations to the Review Conference)*.

Annex I

Abbreviations, Acronyms and Glossary of Terms

Abbreviations and Acronyms

Items that appear in the *Glossary* are marked *

ABACC	Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials	IRBM	intermediate-range ballistic missile
ABM	anti-ballistic missile*	ISFS	International Spent Fuel Storage
ACDA	Arms Control and Disarmament Agency (US)	ISIS	International Safeguards Information System
ALCM	air-launched cruise missile	LEU	low enriched uranium*
ANF	Atlantic Nuclear Force	LTBT	Limited Test Ban Treaty (also known as the Partial Test Ban Treaty)
ASW	anti-submarine warfare	LWR	Light Water Reactor
BMD	ballistic missile defence	MBA	material balance area*
CACNARE	Convention on Assistance in the Case of Nuclear Accident	MLF	Multilateral Force
CANDU	Canadian Deuterium-Uranium reactor	MNA	multilateral nuclear approach
CAS	Committee on Assurances of Supply* (IAEA)	MOX	mixed oxide fuel
CCD	Conference of the Committee on Disarmament*	MTCR	Missile Technology Control Regime*
CD	Conference on Disarmament* (formerly Committee on Disarmament)	MW	Megawatt*
CFE	Conventional Forces in Europe [Treaty]	NAM	Non-Aligned Movement
CMA	continuous material accountancy	NATO	North Atlantic Treaty Organization
CMEA	Council for Mutual Economic Assistance (Eastern Europe)	NNA	Neutral and Non-Aligned countries
COCOM	Coordinating Committee on Export Controls	NNPA	United States Nuclear Non-Proliferation Act (1978)
CPPNM	Convention on the Physical Protection of Nuclear Materials	NNWS	non-nuclear weapon states*
CSBM	confidence- and security-building measure	NPT	Non-Proliferation Treaty*
CSCE	Conference on Security and Co-operation in Europe	NSG	Nuclear Suppliers Group*
CSNI	OECD Nuclear Energy Agency Committee on the Safety of Nuclear Installations	NWFZ	nuclear-weapon-free zone*
CTBT	Comprehensive Test Ban Treaty*	NWS	nuclear weapon states*
EC	European Community	OAS	Organization of American States
ENDC	Eighteen-Nation Disarmament Committee*	OECD	Organization for Economic Co-operation and Development
EURATOM	European Atomic Energy Community	OPANAL	Agency for the Prohibition of Nuclear Weapons in Latin America*
EURODIF	European Gaseous Diffusion Uranium Enrichment Consortium	OSI	on-site inspection*
FBR	Fast Breeder Reactor	PNE	peaceful nuclear explosion
FSS	full scope safeguards*	PNET	Peaceful Nuclear Explosions Treaty*
GCD	General and Complete Disarmament	PSI	Proliferation Security Initiative
GPALS	Global Protection Against Limited Strikes	PTBT	Partial Test Ban Treaty*
GTRI	Global Threat Reduction Initiative	PWR	Pressurized Water Reactor
GW	Gigawatt*	SALT	Strategic Arms Limitation Talks or Treaty
HEU	highly enriched uranium*	SDI	Strategic Defense Initiative (US)
IADA	International Atomic Development Authority	SLBM	submarine launched ballistic missile
IAEA	International Atomic Energy Agency*	SLCM	sea launched cruise missile
ICBM	inter-continental ballistic missile	SNDV	Strategic Nuclear Delivery Vehicle
ICF	Inertial Confinement Fusion	SNF	Short Range Nuclear Forces
IFRC	International Fusion Research Council	SOP	Statement of Interdiction Principles (PSI)
INF	Intermediate-range Nuclear Forces [Treaty]*	SORT	Strategic Offensive Reductions Treaty (also known as the Moscow Treaty)
INFA	International Nuclear Fuel Agency	SSBN	Ballistic missile-equipped, nuclear-powered submarine
INFCE(P)	International Nuclear Fuel Cycle Evaluation (Programme)	START	Strategic Arms Reduction Talks/Treaty*
INFCIRC	IAEA Information Circular*	SWU	Separative Work Unit*
INIS	International Nuclear Information System (IAEA)	TTBT	Threshold Test Ban Treaty*
INSAG	International Nuclear Safety Advisory Group(IAEA)	UNAEC	United Nations Atomic Energy Commission
IPS	International Plutonium Storage	UNCPCIPUNE	United Nations Conference on the Promotion of International Cooperation in the Peaceful Uses of Nuclear Energy

Glossary

Terms defined elsewhere in the Glossary are indicated in *italic type*.

Agency for the Prevention of Nuclear Weapons in Latin America (OPANAL) Spanish title: Organismo para la Proscripción de las Armas Nucleares en la América Latina. Created by the Treaty of Tlatelolco 'to ensure compliance with the obligations of [the] Treaty'.

anti-ballistic missile (ABM) A missile designed to intercept and destroy incoming ballistic missiles. Can also be used to describe the entire defence system, as well as the missile itself. For the US and Russia, such systems are covered by the Anti-Ballistic Missile Treaty which places limits on the siting and numbers of ABM systems.

anti-tactical ballistic missile (ATBM) An *anti-ballistic missile* system designed to intercept short-range *ballistic missiles*.

atom The atom is the basic building block of matter. It is formed from a *nucleus* and electrons. The electrons, which are negatively charged, surround the positively-charged nucleus. The nucleus is formed from *protons* and *neutrons*. The number of protons in a nucleus affect the chemical properties of the atom (i.e., how it will react with other atoms) while the number of neutrons affect its physical properties (i.e., its mass and its fissile and radioactive characteristics). In an atom, the number of electrons equals the number of protons, and this number is called the

atomic number. Thus, in an atom of uranium, atomic number 92, there are 92 protons in the nucleus. Atoms with the same atomic number are chemically identical and are known as elements. Nuclei of atoms of the same element/atomic number may, however, contain different numbers of neutrons. These variations of atoms of an element are called *isotopes*. Isotopes have great significance for nuclear energy because only some isotopes of some elements can undergo *fission*. For example uranium-235 (commonly written as U-235 or U^{235}) is fissile while U-238 is not. Therefore, to create *fissile material*, sufficient quantities of the fissile isotopes must be brought together.

ballistic missile (BM) A missile that gains its altitude through its source of propulsion, usually a rocket motor, rather than by aerodynamic lift with wings. A ballistic missile usually descends on its target under free-fall, following a ballistic trajectory. Long-range ballistic missiles will exit the atmosphere, before returning to earth, hence the term *re-entry vehicle* to describe the payload capsule of such a missile.

book inventory A term used in nuclear safeguards which means the algebraic sum of the most recent *physical inventory of a material balance area* and of all inventory changes that have occurred since that physical inventory was taken.

bulk handling facility A nuclear facility in which nuclear material is held, processed or used in a loose form, such as a liquid, gas or powder. Examples of such facilities are conversion, enrichment, fabrication and reprocessing plants.

calutron A device used in isotopic enrichment based on the principle that molecules of different masses follow different trajectories in an electro-magnetic field. Calutrons, also known as 'racetracks', are based on giant circular magnets. The molecules being separated follow a curved path within the field before being collected.

centrifuge A device used in isotopic enrichment that separates molecules of different masses by spinning them at high speed in a container leaving comparatively heavier molecules on the walls and lighter ones in the centre.

chain reaction A reaction, in a body of *fissile material*, in which additional *neutrons* from atoms undergoing *fission* are sufficient in number for the reaction to be self-sustaining. The quantity of material at which this reaction first takes place is called a *critical mass*.

challenge inspection An *on-site inspection* called at short notice in order to check compliance with a treaty obligation. Some challenge inspections are known as 'anytime, anywhere' which, as the name implies, can be carried out at sites not declared in the relevant treaty.

Committee on Assurances of Supply (CAS) [IAEA] Established by the IAEA in 1980 to consider methods to assure supplies of nuclear materials to importing states, while minimizing risks of nuclear proliferation.

Committee on Disarmament (CD) Convened in January 1979 as a replacement for the *Conference on the Committee on Disarmament* following a recommendation by the First United Nations Special Session on Disarmament. The CD was comprised of 40 states. The CD became the *Conference on Disarmament* following a recommendation by the United Nations General Assembly in 1984.

Comprehensive Test Ban Treaty (CTBT) A treaty to prohibit all nuclear testing. Negotiations concluded in the CD in 1996 and it was opened for signature in that year.

Conference of the Committee on Disarmament (CCD) Formed in 1969, when the *Eighteen-Nation Disarmament Committee* was expanded to include additional members. An expansion to 31 members was agreed in 1975. Achievements of the CCD include the 1971 Seabed Treaty and the 1972 Biological Weapons Convention. The CCD was replaced by the *Committee on Disarmament* in 1979.

Conference on Disarmament (CD) The sole multilateral arms control and disarmament negotiating forum, based in Geneva, with a United Nations-provided secretariat. It tends to operate by creating *ad hoc* committees in which discussion takes place. Treaties negotiated by it include the Chemical Weapons Convention and the *CTBT*. Until 1984 the CD was known as the *Committee on Disarmament*. In 1996 its membership was increased from 38 to 61.

critical mass The quantity of material which is the minimum required to create a *chain reaction*. This quantity varies according to the following factors: the *elements* and *isotopes* involved; the concentration of the fissile isotopes in the material; and the pressure on the material. The

last of these is highly significant in the designs of some nuclear weapons, as a near-critical mass can become critical by compressing the material with explosives to increase its density. This is the basis of an implosion weapon.

cruise missile A missile that gains its altitude from aerodynamic lift. Usually continuously propelled by a jet engine.

cumulative material unaccounted for (CUMUF) A statistical analysis of the *material unaccounted for* (MUF) figures for a nuclear activity under safeguards. As individual MUF figures are subject to errors, CUMUF gives a much clearer idea of whether material is being diverted from an activity or not.

Effective kilogram (ekg) A term used in nuclear safeguards for quantifying nuclear material. The quantity in effective kilograms is obtained by taking: (a) for plutonium, its weight in kilograms; (b) for uranium with an enrichment of 0.01 (1%) and above, its weight in kilograms multiplied by the square of its enrichment; (c) for uranium with an enrichment below 0.01 (1%) and above 0.005 (0.5%), its weight in kilograms multiplied by 0.0001; and (d) for depleted uranium with an enrichment of 0.005 (0.5%) or below, and for thorium, its weight in kilograms multiplied by 0.00005.

Eighteen-Nation Disarmament Committee (ENDC) First convened in March 1962 following a resolution of the United Nations General Assembly in 1961. Achievements of the ENDC include assistance in the negotiation of the 1963 PTBT and completion of the NPT in 1968. In 1969 the ENDC was expanded and became the *Conference of the Committee on Disarmament*. Parties of the ENDC were: Burma; Brazil; Bulgaria; Canada; Czechoslovakia; Ethiopia; France; India; Italy; Mexico; Nigeria; Poland; Romania; Sweden; United Arab Emirates; United Kingdom; United States of America; and the Soviet Union.

enrichment The process of increasing the concentration of one material within another. Most commonly used in relation to U-235 (a fissile isotope) and U-238 (non-fissile). 'Enrichment' is a subtractive process in which unwanted material is removed. Enrichment processes and equipment include gaseous diffusion, centrifuges, calutrons and laser enrichment. The work or energy required for enrichment is given in *Separative Work Units*. Enrichment facilities are sometimes known as 'isotope separation plants'. The term enrichment is also used, when quantifying nuclear materials, to describe the ratio of the combined weight of the fissile to that of the total material in question.

European Atomic Energy Community (EURATOM) The EURATOM Treaty entered into force on 1 January 1958 and covers all areas of European Community nuclear policy, from co-ordinating nuclear energy development to operating a regional nuclear safeguards system.

fissile material Material containing atoms capable of undergoing *fission*.

fission A process by which a nucleus of an atom splits into two when struck by a neutron. This process, which only certain isotopes of certain elements can undergo, releases large amounts of energy and further neutrons. If conditions are right, these further neutrons can cause a *chain reaction*.

full-scope safeguards (FSS) Safeguards that cover all nuclear materials and installations in a state (see *safeguards (IAEA)*). The application of full-scope, sometimes termed comprehensive, safeguards to a state is often a precondition to transfers of nuclear materials and technologies.

fusion The formation of a heavier nucleus from two lighter ones. As with *fission*, fusion can only occur with particular isotopes of elements; most notably, tritium and deuterium, both isotopes of hydrogen.

gaseous diffusion An enrichment or separation technique using the property that comparatively heavier molecules travel through a fine mesh at a slower rate than lighter ones.

Gigawatt (GW) A unit of power based on the *Watt*. One Gigawatt equals 1,000,000,000 Watts.

highly enriched uranium (HEU) Uranium that has been enriched such that it contains more than 20 per cent U-233 and/or U-235.

horizontal proliferation The increase in the number of states capable of possessing, manufacturing or deploying a given weapons technology. Usually used to describe the spread of nuclear weapon or ballistic missile capabilities.

IAEA information circular (INFCIRC) For example, INFCIRC/153. Used as a shorthand way of referring to documents, such as safeguards agreements. Significant documents circulated in this way include:

INFCIRC/9 — Agreement on the Privileges and Immunities of the Agency.

INFCIRC/39 — The Agency's Inspectorate

INFCIRC/66 — The Agency's Safeguards System

INFCIRC/153 — The Structure and Content of Agreements between the Agency and States required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons IN FCIRC/209 — Communications Received from Members Regarding the Export of Nuclear Material and of Certain Categories of Equipment and other Material

INFCIRC/225 — The Physical Protection of Nuclear Material

INFCIRC/254 — Communications Received from Certain Member States Regarding Guidelines for the Export of Nuclear Material, Equipment or Technology [London Club suppliers guidelines]

INFCIRC/540 — Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards.

Integrated safeguards The combination of comprehensive safeguards agreements and additional protocols tailored to individual states.

Intermediate-range Nuclear Forces (INF) [Treaty] This treaty between the United States and the Soviet Union covers the verified elimination of all land-based missiles with ranges between 500 and 5500 km, irrespective of warhead type. The treaty does not cover the warheads, which may be re-used on other delivery systems.

International Atomic Energy Agency (IAEA) A United Nations agency with responsibilities to implement *safeguards* on nuclear materials and promote the peaceful uses of nuclear power.

Irish Resolution A resolution concerning nuclear non-proliferation introduced to the United Nations by Ireland in 1961 and passed unanimously.

isotope See *atom*

Joule (J) A primary unit of energy, used as an international standard. See *Watt*.

laser enrichment Laser enrichment exploits the fact that different isotopes of an element have slightly different energy levels due to their different masses. By tuning lasers to wavelengths of light that correspond to particular energy levels of specific isotopes, those isotopes will absorb the extra energy and can then be separated.

low enriched uranium Uranium that has been enriched such that its concentration of U-233 and/or U-235 is greater than in natural uranium, but is less than 20 per cent.

Material Balance Area (MBA) A term used in nuclear safeguards to describe an area such that the quantity of nuclear material in each transfer into or out of it can be determined and that the *physical inventory* of nuclear material in it can be determined when necessary, in order that the material balance for safeguards purposes can be established.

Material Unaccounted For (MUF) A term used in nuclear safeguards to describe the difference between the *book inventory* and the *physical inventory* of nuclear material at a location under safeguards..

Megawatt (MW) A unit of power based on the *Watt*. One Megawatt equals 1,000,000 Watts.

Missile Technology Control Regime (MTCR) Internationally agreed guidelines on the export or transfer of ballistic missile technologies between states.

moderator A material used to lower the energy levels of *neutrons*, to help sustain a *fission* reaction. Materials used as moderators include graphite and water.

multinational technical means (MTM) Technologies and techniques used in *national technical means*, but gathered by, or shared between, a group of states.

multiple independently targetable re-entry vehicles (MIRV) A system whereby more than one target may be attacked from warheads on a single missile. (see also *re-entry vehicle*)

national technical means (NTM) Technologies and techniques used for intelligence gathering that may be useful to ascertain compliance with a treaty or agreement. NTMs include reconnaissance satellites and signals intelligence gathering.

negative security assurance[s] A form of *security assurance* whereby a

nuclear-weapon state guarantees that it will not use or threaten to use nuclear weapons against a *non-nuclear-weapon state* under all or certain circumstances.

neutron A particle carrying no electrical charge that forms part of the *nucleus* of an *atom*. It is of approximately the same mass as a *proton*. Neutrons also exist outside of the nucleus. See also *atom*.

non-nuclear-weapon state (NNWS) A state that is not a *nuclear-weapon state* as defined by the *NPT*, i.e., a state which has **not** 'manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967'.

Nuclear Non-Proliferation Treaty (NPT) Signed on 1 July 1968, entered into force 5 March 1970. The treaty's formal title is 'Treaty on the Non-Proliferation of Nuclear Weapons'.

Nuclear Suppliers Group (NSG) A grouping of nations, also called the London Club, that have reached agreement on controls on exports of nuclear materials and technologies. These are known as the Guidelines for Nuclear Transfers.

nuclear-weapons-free zone (NWFZ) A zone, normally established by treaty, that is free of nuclear weapons. Existing NWFZs cover the Antarctic (established by the Antarctic Treaty), Latin America (Treaty of Tlatelolco), the South Pacific (Treaty of Rarotonga), Southeast Asia (Treaty of Bangkok) and Africa (Treaty of Pelindaba). There are also NWFZs on the seabed (Seabed Treaty) and in outer space (Outer Space Treaty).

nuclear-weapon state (NWS) As defined in the Non-Proliferation Treaty, this is any state that 'manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967'. These are the Russian Federation (as successor state to the Soviet Union), the United States, the United Kingdom, China and France. India, which exploded a nuclear device in 1974, is not a nuclear-weapon state under the NPT definition.

nucleus The centre of an atom, formed from *protons* and *neutrons*. The numbers of protons in a nucleus affect the chemical properties of the atom (i.e., how it will react with other atoms) while the number of neutrons affect its physical properties (i.e., its mass and its fissile and radioactive characteristics).

on-site inspection An inspection at a site within the realm of application of a treaty or agreement. Such an inspection may be a routine, confidence-building measure or may be a *challenge inspection*.

Partial Test Ban Treaty (PTBT) The PTBT, which entered into force in 1963, bans nuclear testing by its signatories in the atmosphere, in outer space or under water. The PTBT is also known as the Limited Test Ban Treaty.

Peaceful Nuclear Explosions Treaty (PNET) A bilateral treaty between the United States of America and the Soviet Union, signed in 1976 but not ratified until 1990. The treaty aimed to ensure that any nuclear tests carried out outside of established test sites were for peaceful purposes.

physical inventory A term used in nuclear safeguards which means 'the sum of all the measured or derived estimates of batch quantities of nuclear material on hand at a given time within a *material balance area*, obtained in accordance with specified procedures.'

positive security assurances A form of security assurance whereby a *nuclear-weapon state* guarantees to take action in support of a *non-nuclear-weapon state* in the event of a threat of attack or an actual attack with nuclear weapons.

proton A particle carrying a positive electrical charge that forms part of the *nucleus* of an *atom*. It is of approximately the same mass as a *neutron*. See also *atom*.

re-entry vehicle (RV) The component of a long-range *ballistic missile* that re-enters the atmosphere, and which contains the warhead, together with any terminal guidance equipment.

reprocessing The treatment of spent reactor fuel to separate plutonium, uranium and fission products.

safeguards (IAEA) Measures applied to peaceful uses of nuclear energy by the International Atomic Energy Agency to verify that they are not used for military purposes. Safeguards agreements made under the terms of INFCIRC/66 are applied to nuclear and other materials, services, equipment, facilities and information specified in the agreement. Safeguards agreements made under the terms of

INFCIRC/153 are designed for *non-nuclear-weapon state* parties to the NPT and are applied to all nuclear materials in all of the peaceful nuclear activities of the state; such safeguards come under the category *full-scope safeguards*. Other, less common, forms of IAEA safeguards include: those organized pursuant to the Tlatelolco Treaty, which are very similar to those made under the terms of INFCIRC/153; full-scope safeguards where a state is not a party to the NPT; and voluntary offer agreements by *nuclear-weapon states* in which some or all of their peaceful nuclear activities are covered by safeguards.

seal A device attached to an object designed to indicate, for example, by breakage or deformation, if that object has been interfered or tampered with in an unauthorised manner. The International Atomic Energy Agency uses seals to assist in their accounting of nuclear materials under *safeguards*.

security assurances See *negative security assurances* and *positive security assurances*.

Separative Work Unit (SWU) Unit for measuring the work required to separate different isotopes in an *enrichment* process. The formula is complex, but is related to the following factors: quantity of enriched product from the feed material required (more product=more SWUs per unit of product); quantity of feed material (more feed=fewer SWUs); level of enrichment required (more concentrated=more SWUs); concentration of required isotope in the feed material (higher concentration=fewer SWUs); and concentration of wanted material in the tails or waste (higher concentration=fewer SWUs).

Strategic Arms Reduction Treaty/Talks (START) Bilateral treaties between the United States of America and the Soviet Union (now Russian Federation). START-2 was signed in July 1991 with START-2 signed in January 1993.

Strategic Offensive Reductions Treaty (SORT) Also known as the Moscow Treaty, the Treaty on Strategic Offensive Reductions is a bilateral treaty between the U.S. and the Russian Federation. The treaty requires each state to reduce and limit its strategic nuclear warheads to 1,700-2,000 by December 31, 2012. (The Treaty was signed by the respective presidents (George W. Bush and Vladimir Putin) on May 24, 2002, and ratified by the respective domestic

legislative bodies (the U.S. Senate on March 7, 2003 and the Russian Duma on May 15, 2003)).

tactical air-to-surface missile (TASM) A generic term covering air-to-surface missiles with ranges of a few hundred kilometres. Examples of these missiles are the Short-Range Attack Missile-Tactical (SRAM-T), recently under development by the United States; and the Air-Sol à Longue Portée (ASLP), currently under development by France.

tag A device attached to an object that makes that object individually identifiable. Tags have uses in verifying that a state has less than a certain number of items limited by a treaty or agreement by allowing accurate counting of such items. See also *seal*.

Threshold Test Ban Treaty (TTBT) A treaty between the United States and the Soviet Union that prohibits nuclear tests above 150 kilotons. First negotiated in 1976, it was not ratified by the United States until 1990.

treaty-limited equipment (TLE) Those items regulated by provisions of a treaty, such as the *Intermediate-range Nuclear Forces Treaty*. In some treaties the term *treaty-limited item* is used instead.

treaty-limited item[s] (TLI) See *treaty-limited equipment*

vertical proliferation The quantitative and/or qualitative increase in the possession, manufacture or deployment of a given weapons technology by an individual state. Usually used to describe the increase of nuclear weapon or ballistic missile capabilities.

Watt (W) Primary measuring unit of power, that is energy produced or consumed in a given unit of time. 1 Watt = 1 *Joule* produced or consumed in one second. More commonly used are the units *Megawatt* (MW =1,000,000 Watts) and *Kilowatt* (kW =1,000 Watts). NB – the power of the heat output of the core of a nuclear reactor is measured in MW(th) — Megawatts of thermal power, but the electrical output is given as MW(e) — Megawatts of electrical power, which is always less than the MW(th) figure.

weaponization Development required to make a technology usable as a weapon.