Civil Services Preliminary Examination 2010

Weapon of Mass Destruction

A weapon of mass destruction (WMD) is a weapon that can kill large numbers of humans (and other life forms) and/or cause great damage to man-made structures (e.g. buildings), natural structures (e.g. mountains), or the biosphere in general. The scope and application of the term has evolved and been disputed, often signifying more politically than technically.

Coined in reference to aerial bombing with chemical explosives, it has come to distinguish large-scale weaponry of other technologies, such as chemical, biological, radiological, or nuclear. This differentiates the term from more technnical ones such as chemical, biological, radiological, and nuclear weapons (CBRN).

The first use of the term "weapon of mass destruction" on record is by Cosmo Gordon Lang, Archbishop of Canterbury, in 1937 in reference to the aerial bombardment of Guernica, Spain:
" Who can think at this present time without a sickening of the heart of the appalling slaughter, the suffering, the manifold misery brought by war to Spain and to China? Who can think without horror of what another widespread war would mean, waged as it would be with all the new weapons of mass destruction?"

At that time, there were no nuclear weapons; biological weapons were already being researched by Japan (see Unit 731), and chemical weapons had seen wide use, most notably in World War I.

Following the atomic bombings of Hiroshima and Nagasaki, and progressing through the Cold War, the term came to refer more to non-conventional weapons. The application of the term to specifically nuclear and radiological weapons is traced by William Safire to the Russian phrase oruziye massovovo porazheniya.

He credits James Goodby (of the Brookings Institution) with tracing what he considers the earliest known English-language use soon after the nuclear bombing of Hiroshima and Nagasaki (although it is not quite verbatim): a communique from a November 15, 1945, meeting of Harry Truman, Clement Attlee and Mackenzie King (probably drafted by Vannevar Bush– or so Bush claimed in 1970) referred to "weapons adaptable to mass destruction". That exact phrase, says Safire, was also used by Bernard Baruch in 1946 (in a speech at the United Nations probably written by Herbert Bayard Swope). The same phrase found its way into the UN resolution to create the Atomic Energy Commission (predecessor of the International Atomic Energy Agency (IAEA)), which used the wording "... atomic weapons and of all other weapons adaptable to mass destruction".

An exact use of this term was given in a lecture "Atomic Energy as an Atomic Problem" by J. Robert Oppenheimer. The lecture was delivered to the Foreign Service and the State Department, on September 17, 1947. The lecture is reprinted in The Open Mind (New York: Simon and Schuster, 1955). "It is a very far reaching control which would eliminate the rivalry between nations in this field, which would prevent the surreptitious arming of one nation against another, which would provide some cushion of time before atomic attack, and presumably therefore before any attack with weapons of mass destruction, and which would go a long way toward removing atomic energy at least as a source of conflict between the powers".

The term was also used in the introduction to the hugely influential US Government Document known as NSC-68 written in April 1950.

An early use of the exact phrase in an international treaty was in the Outer Space Treaty of 1967, however no definition was provided.

Evolution of its use

During the Cold War, the term "weapons of mass destruction" was primarily a reference to nuclear weapons. At the time, as a necessary deterrent against nuclear or conventional attack from the Soviet Union (see Mutual Assured Destruction), and the euphemism "strategic weapons" was used to refer to the American nuclear arsenal.

The term "weapons of mass destruction" continued to see periodic use throughout this time, usually in the context of nuclear arms control; Ronald Reagan used it during the 1986 Reykjavík Summit, when referring to the 1967 Outer Space Treaty.[4] Reagan's successor, George H.W. Bush, used the term in an 1989 speech to the United Nations, using it primarily in reference to chemical arms.

The end of the Cold War reduced U.S. reliance on nuclear weapons as a deterrent, causing it to shift its focus to disarmament. This period coincided with an increasing threat to U.S. interests from Islamic nations and independent Islamic groups.

With the 1990 invasion of Kuwait and 1991 Gulf War, Iraq's nuclear, biological, and chemical weapons programs became a particular concern of the first Bush Administration. Following the war, the Clinton Administration and other western politicians and media continued to use the term, usually in reference to ongoing attempts to dismantle Iraq's weapons programs.

After the September 11, 2001 attacks and the 2001 anthrax attacks, an increased fear of non-conventional weapons and asymmetrical warfare took hold of the United States and other Western powers. This fear reached a crescendo with the 2002 Iraq disarmament crisis and the alleged existence of weapons of mass destruction in Iraq that became the primary justification for the 2003 invasion of Iraq. However, no WMD were found in Iraq.

Because of its prolific use during this period, the American Dialect Society voted "weapons of mass destruction" (and its abbreviation, "WMD") the word of the year in 2002, and in 2003 Lake Superior State University added WMD to its list of terms banished for "Mis-use, Over-use and General Uselessness".

Definitions of the term

Military / Strategic Definitions

The most widely used definition of "weapons of mass destruction" is that of nuclear, biological or chemical weapons (NBC) although there is no treaty or customary international law that contains an authoritative definition. Instead, international law has been used with respect to the specific categories of weapons within WMD, and not to WMD as a whole.

The acronyms NBC (for nuclear, biological and chemical) or CBR (chemical, biological, radiological) are used with regards to battlefield protection systems for armored vehicles, because all three involve insidious toxins that can be carried through the air and can be protected against with vehicle air filtration systems.

However, there is an argument that nuclear and biological weapons do not belong in the same category as chemical and "dirty bomb" radiological weapons, which have limited destructive potential (and close to none, as far as property is concerned), whereas nuclear and biological weapons have the unique ability to kill large numbers of people with very small amounts of material, and thus could be said to belong in a class by themselves.

The NBC definition has also been used in official U.S. documents, by the U.S. President, the U.S. Central Intelligence Agency, the U.S. Department of

Defense, and the U.S. Government Accountability Office.

Other documents expand the definition of WMD to also include radiological or conventional weapons. The U.S. military refers to WMD as:
Chemical, biological, radiological, or nuclear weapons capable of a high order of destruction or causing mass casualties and exclude the means of transporting or propelling the weapon where such means is a separable and divisible part from the weapon. Also called WMD.

The significance of the words separable and divisible part of the weapon is that missiles such as the Pershing II and the SCUD are considered weapons of mass destruction, while aircraft capable of carrying bombloads are not.

In 2004, the United Kingdom's Butler Review recognized the "considerable and long-standing academic debate about the proper interpretation of the phrase 'weapons of mass destruction'".

The committee set out to avoid the general term but when using it, employed the definition of United Nations Security Council Resolution 687, which defined the systems which Iraq was required to abandon:

- "Nuclear weapons or nuclear-weapons-usable material or any sub-systems or components or any research, development, support or manufacturing facilities relating to [nuclear weapons].

- Chemical and biological weapons and all stocks of agents and all related subsystems and components and all research,development,support and manufacturing facilities.

- Ballistic missiles with a range greater than 150 kilometres and related major parts, and repair and production facilities."

Chemical weapons expert Gert G. Harigel considers only nuclear weapons true weapons of mass destruction, because "only nuclear weapons are completely indiscriminate by their explosive power, heat radiation and radioactivity, and only they should therefore be called a weapon of mass destruction". He prefers to call chemical and biological weapons "weapons of terror" when aimed against civilians and "weapons of intimidation" for soldiers.

Testimony of one such soldier expresses the same viewpoint. For a period of several months in the winter of 2002–2003, U.S. Deputy Secretary of Defense Paul Wolfowitz frequently used the term "weapons of mass terror," apparently also recognizing the distinction between the psychological and the physical effects of many things currently falling into the WMD category.

Gustavo Bell Lemus, the Vice President of Colombia, at the 2001 United Nations Conference on the Illicit Trade in Small Arms and Light Weapons in All Its Aspects, quoted the Millennium Report of the UN Secretary-General to the General Assembly, in which Kofi Annan said that small arms could be described as WMD because the fatalities they cause "dwarf that of all other weapons systems - and in most years greatly exceed the toll of the atomic bombs that devastated Hiroshima and Nagasaki".

An additional condition often implicitly applied to WMD is that the use of the weapons must be strategic. In other words, they would be designed to "have consequences far outweighing the size and effectiveness of the weapons themselves". The strategic nature of WMD also defines their function in the military doctrine of total war as targeting the means a country would use to support and supply its war effort, specifically its population, industry, and natural resources.

Within U.S. civil defense organizations, the category is now Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE), which defines WMD as:
(1) Any explosive, incendiary, poison gas, bomb, grenade, or rocket having a propellant charge of more than four ounces [113 g], missile having an explosive or incendiary charge of more than one-quarter ounce [7 g], or mine or device similar to the above.

(2) Poison gas.
(3) Any weapon involving a disease organism.
(4) Any weapon that is designed to release radiation at a level dangerous to human life.

Nuclear Non-Proliferation Treaty

The Treaty on the Non-Proliferation of Nuclear Weapons, also Nuclear Non-Proliferation Treaty (NPT or NNPT) is a treaty to limit the spread (proliferation) of nuclear weapons. The treaty came into force on 5 March 1970 and currently there are 189 states party to the treaty, five of which are recognized as nuclear weapon states: the United States, Russia, the United Kingdom, France, and China (also the five permanent members of the United Nations Security Council).

Four non-parties to the treaty are known or believed to possess nuclear weapons. India, Pakistan and North Korea have openly tested and declared that they possess nuclear weapons, while Israel has had a policy of opacity regarding its own nuclear weapons program. North Korea acceded to the treaty, violated it, and withdrew from it in 2003.

The treaty was proposed by Ireland and Finland and they were the first to sign.

The NPT consists of a preamble and eleven articles. Although the concept of "pillars" appears nowhere in the NPT, the treaty is nevertheless sometimes interpreted as a three pillar system, with an implicit balance among them:

1. non-proliferation,
2. disarmament, and
3. the right to peacefully use nuclear technology.

The treaty is reviewed each five years in meetings called Review Conferences of the Parties to the Treaty of Non-Proliferation of Nuclear Weapons. In addition, Sessions of the Preparatory Committee for the Review Conference take place on the intermediate years. Simultaneously, many events organized by independent institutions, groups of experts, think tanks and NGO's take place worldwide in order to provide reports and recommendations that compliment the Preparatory Committees.

Even though the treaty was originally conceived with a limited duration of 25 years, the signing parties decided by consensus to extend the treaty indefinitely and without conditions during the Review Conference in New York City on May 11, 1995. The next Review Conference will be held in May, 2010.

Treaty "pillars"

The NPT is commonly described as having three main "pillars": non-proliferation, disarmament, and peaceful use. This "pillars" concept has been questioned by some who believe that the NPT is, as its name suggests, principally about nonproliferation, and who worry that "three pillars" language misleadingly implies that the three elements have equivalent importance.

First pillar: Non-Proliferation

Five states are recognized by the NPT as nuclear weapon states (NWS): China (signed 1992), France (1992), the Soviet Union (1968; obligations and rights now assumed by the Russian Federation), the United Kingdom (1968), and the United States (1968) (The U.S., UK, and Soviet Union were the only states openly possessing such weapons among the original ratifiers of the treaty, which entered into force in 1970).

These five nations are also the five permanent members of the United Nations Security Council. These five NWS agree not to transfer "nuclear weapons or other nuclear explosive devices" and "not in any way to assist, encourage, or induce" a non-nuclear weapon state (NNWS) to acquire nuclear weapons (Article I). NNWS parties to the NPT agree not to "receive," "manufacture" or "acquire" nuclear weapons or to "seek or receive any assistance in the manufacture of nuclear weapons" (Article II).

NNWS parties also agree to accept safeguards by the International Atomic Energy Agency (IAEA) to verify that they are not diverting nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices (Article III).

The five NWS parties have made undertakings not to use their nuclear weapons against a non-NWS party except in response to a nuclear attack, or a conventional attack in alliance with a Nuclear Weapons State. However, these undertakings have not been incorporated formally into the treaty, and the exact details have varied over time. The U.S. also had nuclear warheads targeted at North Korea, a non-NWS state, from 1959 until 1991.

The previous United Kingdom Secretary of State for Defence, Geoff Hoon, has also explicitly invoked the possibility of the use of the country's nuclear weapons in response to a non-conventional attack by "rogue states". In January 2006, President Jacques Chirac of France indicated that an incident of state-sponsored terrorism on France could trigger a small-scale nuclear retaliation aimed at destroying the "rogue state's" power centers.

Second Pillar: Disarmament

The NPT's preamble contains language affirming the desire of treaty signatories to ease international tension and strengthen international trust so as to create someday the conditions for a halt to the production of nuclear weapons, and treaty on general and complete disarmament that liquidates, in particular, nuclear weapons and their delivery vehicles from national arsenals.

The wording of the NPT's Article VI arguably imposes only a vague obligation on all NPT signatories to move in the general direction of nuclear and total disarmament, saying, "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 this interpretation, Article VI does not strictly require all signatories to actually conclude a disarmament treaty. Rather, it only requires them "to negotiate in good faith."

On the other hand, some governments, especially non-nuclear-weapon states belonging to the Non-Aligned Movement, have interpreted Article VI's language as being anything but vague. In their view, Article VI constitutes a formal and specific obligation on the NPT-recognized nuclear-weapon states to disarm themselves of nuclear weapons, and argue that these states have failed to meet their obligation.

Some government delegations to the Conference on Disarmament have put forth proposals for a complete and universal disarmament, but no disarmament treaty has emerged from these proposals. Critics of the NPT-recognized nuclear-weapon states sometimes argue that what they view as the failure of the NPT-recognized nuclear weapon states to disarm themselves of nuclear weapons, especially in the post-Cold War era, has angered some non-nuclear-weapon NPT signatories of the NPT. Such failure, these critics add, provides justification for the non-nuclear-weapon signatories to quit the NPT and develop their own nuclear arsenals.

Other observers have suggested that the linkage between proliferation and disarmament may also work the other way, i.e., that the failure to resolve proliferation threats in Iran and North Korea, for instance, will cripple the prospects for disarmament. No current nuclear weapons state, the argument goes, would seriously consider eliminating its last nuclear weapons without high confidence that other countries would not acquire them.

Some observers have even suggested that the very progress of disarmament by the superpowers which has led to the elimination of thousands of weapons and delivery systems could eventually make the possession of nuclear weapons more attractive by increasing the perceived strategic value of a small arsenal.

As one U.S. official and NPT expert warned in 2007, "logic suggests that as the number of nuclear weapons decreases, the 'marginal utility' of a nuclear weapon as an instrument of military power increases. At the extreme, which it is precisely disarmament's hope to create, the strategic utility of even one or two nuclear weapons would be huge."

Third Pillar: Peaceful use of Nuclear Energy

The third pillar allows for and agrees upon the transfer of nuclear technology and materials to NPT signatory countries for the development of civilian nuclear energy programs in those countries, as long as they can demonstrate that their nuclear programs are not being used for the development of nuclear weapons.

Since very few of the states with nuclear energy programs are willing to abandon the use of nuclear energy, the third pillar of the NPT under Article IV provides other states with the possibility to do the same, but under conditions intended to make it difficult to develop nuclear weapons.

The treaty recognizes the inalienable right of sovereign states to use nuclear energy for peaceful purposes, but restricts this right for NPT parties to be exercised "in conformity with Articles I and II" (the basic nonproliferation obligations that constitute the "first pillar" of the Treaty).

As the commercially popular light water reactor nuclear power station uses enriched uranium fuel, it follows that states must be able either to enrich uranium or purchase it on an international market. Mohamed ElBaradei, Director General of the International Atomic Energy Agency, has called the spread of enrichment and reprocessing capabilities the "Achilles' heel" of the nuclear nonproliferation regime. As of 2007 13 states have an enrichment capability.

Because the availability of fissile material has long been considered the principal obstacle to, and "pacing element" for, a country's nuclear weapons development effort, it was declared a major emphasis of U.S. policy in 2004 to prevent the further spread of uranium enrichment and plutonium reprocessing (a.k.a. "ENR") technology.

Countries possessing ENR capabilities, it is feared, have what is in effect the option of using this capability to produce fissile material for weapons use on demand, thus giving them what has been termed a "virtual" nuclear weapons program.

The degree to which NPT members have a "right" to ENR technology notwithstanding its potentially grave proliferation implications, therefore, is at the cutting edge of policy and legal debates surrounding the meaning of Article IV and its relation to Articles I, II, and III of the Treaty.

Countries that have signed the treaty as Non-Nuclear Weapons States and maintained that status have an unbroken record of not building nuclear weapons. However, Iraq was cited by the IAEA and sanctioned by the UN Security Council for violating its NPT safeguards obligations; North Korea never came into compliance with its NPT safeguards agreement and was cited repeatedly for these violations, and later withdrew from the NPT and tested multiple nuclear devices; Iran was found in non-compliance with its NPT safeguards obligations in an unusual non-consensus decision because it "failed in a number of instances over an extended period of time" to report aspects of its enrichment program; and Libya pursued a clandestine nuclear weapons program before abandoning it in December 2003.

In 1991 Romania reported previously undeclared nuclear activities by the former regime and the IAEA reported this non-compliance to the Security Council for information only. In some regions, the fact that all neighbors are verifiably free of nuclear weapons reduces any pressure individual states might feel to build those weapons themselves, even if neighbors are known to have peaceful nuclear energy programs that might otherwise be suspicious. In this, the treaty works as designed.

In 2004, Mohamed ElBaradei, the then Director General of the International Atomic Energy Agency (IAEA), said that by some estimates thirty-five to forty states could have the knowledge to develop nuclear weapons.

Key articles

Article I: Each nuclear-weapons state (NWS) undertakes not to transfer, to any recipient, nuclear weapons, or other nuclear explosive devices, and not to assist any non-nuclear weapon state to manufacture or acquire such weapons or devices.

Article II: Each non-NWS party undertakes not to receive, from any source, nuclear weapons, or other nuclear explosive devices; not to manufacture or acquire such weapons or devices; and not to receive any assistance in their manufacture.

Article III: Each non-NWS party undertakes to conclude an agreement with the IAEA for the application of its safeguards to all nuclear material in all of the state's peaceful nuclear activities and to prevent diversion of such material to nuclear weapons or other nuclear explosive devices.

Article IV: *1.* Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also co-operate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.

Article VI. The states undertake 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 towards a "Treaty on general and complete disarmament under strict and effective international control".

Article X. Establishes the right to withdraw from the Treaty giving 3 months' notice. It also establishes the duration of the Treaty (25 years before 1995 Extension Initiative).

History

The impetus behind the NPT was concern for the safety of a world with many nuclear weapon states. It was recognized that the cold war deterrent relationship between just the United States and Soviet Union was fragile. More nuclear players reduced security for all, multiplying the risks of miscalculation, accident or unauthorized use, or through the escalation of a small nuclear conflict.

The NPT process was launched by Frank Aiken, Irish Minister for External Affairs, in 1958. It was opened for signature in 1968, with Finland the first State to sign. By 1992 all five then-declared nuclear powers had signed the treaty, and the treaty was renewed in 1995 (and followed by the Comprehensive Test Ban Treaty in 1996). Several NPT signatories have given up nuclear weapons or nuclear weapons programs. South Africa undertook a nuclear weapons program, allegedly with the assistance of Israel in the 1970s, and may have conducted a nuclear test in the Atlantic ocean in 1979, but has since renounced its nuclear program and signed the treaty in 1991 after destroying its small nuclear arsenal. Several former Soviet Republics destroyed or transferred to Russia the nuclear weapons inherited from the Soviet Union.

United States-NATO nuclear weapons sharing

At the time the treaty was being negotiated, NATO had in place secret nuclear weapons sharing agreements whereby the United States provided nuclear

weapons to be deployed by, and stored in, other NATO states. Some argue this is an act of proliferation violating Articles I and II of the treaty.

A counter-argument is that the U.S. controlled the weapons in storage within the NATO states, and that no transfer of the weapons or control over them was intended "unless and until a decision were made to go to war, at which the treaty would no longer be controlling", so there is no breach of the NPT. These agreements were disclosed to a few of the states, including the Soviet Union, negotiating the treaty, but most of the states that signed the NPT in 1968 would not have known about these agreements and interpretations at that time.

As of 2005, it is estimated that the United States still provides about 180 tactical B61 nuclear bombs for use by Belgium, Germany, Italy, the Netherlands and Turkey under these NATO agreements. Many states, and the Non-Aligned Movement, now argue this violates Articles I and II of the treaty, and are applying diplomatic pressure to terminate these agreements.

They point out that the pilots and other staff of the "non-nuclear" NATO states practice handling and delivering the U.S. nuclear bombs, and non-U.S. warplanes have been adapted to deliver U.S. nuclear bombs which must have involved the transfer of some technical nuclear weapons information. NATO believes its "nuclear forces continue to play an essential role in war prevention, but their role is now more fundamentally political".

NATO officials also point out that no nuclear weapons have ever been given over to non-U.S. control by the United States, so therefore there cannot have been a violation of Article I (which prohibits transferring "nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices") or Article II (which bars "receiv[ing] the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices or of control over such weapons or explosive devices").

U.S. nuclear sharing policies were originally designed to help prevent the proliferation of nuclear weapons—not least by persuading the then West Germany not to develop an independent nuclear capability by assuring it that West Germany would be able, in the event of war with the Warsaw Pact, to wield (U.S.) nuclear weapons in self-defense.

(Until that point of all-out war, however, the weapons themselves would remain "safely" in U.S. hands.) The point was to limit the spread of countries having their own nuclear weapons programs, helping ensure that NATO allies would not choose to go down the proliferation route.

(West Germany was discussed in U.S. intelligence estimates for a number of years as being a country with the potential to develop nuclear weapons capabilities of its own if officials in Bonn were not convinced that their defense against the Soviet Union and its allies could otherwise be met.)

India, Israel and Pakistan

Three states—India, Israel, and Pakistan—have declined to sign the treaty. India and Pakistan are confirmed nuclear powers, and Israel has a long-standing policy of deliberate ambiguity (see List of countries with nuclear weapons). These countries argue that the NPT creates a club of "nuclear haves" and a larger group of "nuclear have-nots" by restricting the legal possession of nuclear weapons to those states that tested them before 1967, but the treaty never explains on what ethical grounds such a distinction is valid.

India and Pakistan have publicly announced possession of nuclear weapons and have detonated nuclear devices in tests, India having first done so in 1974 and Pakistan following suit in 1998 in response to another Indian test. India is estimated to have enough fissile material for more than 150 warheads. Pakistan reportedly has between 80 and 120 warheads according to the former head of its strategic arms division. India is one of the few countries to have a no first use policy, a pledge not to use nuclear weapons unless first attacked by an adversary using nuclear weapons.

The main reason India cites for not signing the NPT and for possessing nuclear weapons is that China is one of the "nuclear haves." India's External Affairs Minister Pranab Mukherjee said during a visit to Tokyo in 2007: "If India did not sign the NPT, it is not because of its lack of commitment for non-proliferation, but because we consider NPT as a flawed treaty and it did not recognise the need for universal, non-discriminatory verification and treatment." China and India have a longstanding border dispute, including a border war in 1962.

According to leaked intelligence, Israel has been developing nuclear weapons at its Dimona site in the Negev since 1958, and many nonproliferation analysts like David Albright estimate that Israel may have stockpiled between 100 to 200 warheads using the plutonium reprocessed from Dimona. The Israeli government refuses to confirm or deny possession of nuclear weapons, although this is now regarded as an open secret after Israeli low level nuclear technician Mordechai Vanunu—later abducted and jailed by Israel—revealed the program to the British Sunday Times in 1986.

In early March 2006, India and the United States finalized a deal, having critics in both countries, to provide India with US civilian nuclear technology. Under the deal India has committed to classify 14 of its 22 nuclear power plants as being for civilian use and to place them under IAEA safeguards. Mohamed ElBaradei, the Director General of the IAEA, welcomed the deal by calling India "an important partner in the non-proliferation regime."

In December 2006, United States Congress approved the United States-India Peaceful Atomic Energy Cooperation Act that was cemented during President Bush's visit to India earlier in the year. The legislation allows for the transfer of civilian nuclear material to India. Despite its status outside the Nuclear Non-Proliferation Treaty, India was granted these transactions on the basis of its clean non-proliferation record, and India's unusually high need for energy fueled by its rapid industrialization and a billion-plus population.

On August 1, 2008, the IAEA approved the India Safeguards Agreement and on September 6, 2008, India was granted the waiver at the Nuclear Suppliers Group (NSG) meeting held in Vienna, Austria. The consensus was arrived after overcoming misgivings expressed by Austria, Ireland and New Zealand and is an unprecedented step in giving exemption to a country, which has not signed the NPT and the Comprehensive Test Ban Treaty (CTBT).

While India could commence nuclear trade with other willing countries. The U.S. Congress approved this agreement and the President signed it on 8 October 2008.

The NSG Guidelines currently rule out nuclear exports by all major suppliers to Pakistan and Israel, with very narrow exceptions, since neither has full-scope IAEA safeguards (i.e. safeguards on all its nuclear activities). Attempts by Pakistan to reach a similar agreement have been rebuffed by the United States and other NSG members.

The argument put forth is that not only does Pakistan lack the same energy requirements but that the track record of Pakistan as a nuclear proliferator makes it impossible for it to have any sort of nuclear deal in the near future.

On September 18, 2009 the General Conference of the International Atomic Energy Agency called on Israel to open its nuclear facilities to IAEA inspection and adhere to the non-proliferation treaty as part of a resolution on "Israeli nuclear capabilities," which passed by a narrow margin of 49-45 with 16 abstentions. The chief Israeli delegate stated that "Israel will not co-operate in any matter with this resolution."

North Korea

North Korea ratified the treaty on December 12, 1985, but gave notice of withdrawal from the treaty on January 10, 2003 following U.S. allegations that it had started an illegal enriched uranium weapons program, and the U.S. subsequently stopping fuel oil shipments under the Agreed Framework which had resolved plutonium weapons issues in 1994.

The withdrawal became effective April 10, 2003 making North Korea the first state ever to withdraw from the treaty. North Korea had once before announced withdrawal, on March 12, 1993, but suspended that notice before it came into effect.

On February 10, 2005, North Korea publicly declared that it possessed nuclear weapons and pulled out of the six-party talks hosted by China to find a diplomatic solution to the issue. "We had already taken the resolute action of pulling out of the Nuclear Non-Proliferation Treaty and have manufactured nuclear arms for self-defence to cope with the Bush administration's evermore undisguised policy to isolate and stifle the DPRK [Democratic People's Republic of Korea]," a North Korean Foreign Ministry statement said regarding the issue. Six-party talks resumed in July 2005.

On September 19, 2005, North Korea announced that it would agree to a preliminary accord. Under the accord, North Korea would scrap all of its existing nuclear weapons and nuclear production facilities, rejoin the NPT, and readmit IAEA inspectors. The difficult issue of the supply of light water reactors to replace North Korea's indigenous nuclear power plant program, as per the 1994 Agreed Framework, was left to be resolved in future discussions. On the next day North Korea reiterated its known view that until it is supplied with a light water reactor it will not dismantle its nuclear arsenal or rejoin the NPT.

On October 2, 2006, the North Korean foreign minister announced that his country was planning to conduct a nuclear test "in the future", although it did not state when. On Monday, October 9, 2006 at 01:35:27 (UTC) the United States Geological Survey detected a magnitude 4.2 seismic event 70 km (45 miles) north of Kimchaek, North Korea indicating a nuclear test. The North Korean government announced shortly afterward that they had completed a successful underground test of a nuclear fission device.

In 2007, reports from Washington suggested that the 2002 CIA reports stating that North Korea was developing an enriched uranium weapons program, which led to North Korea leaving the NPT, had overstated or misread the intelligence.

On the other hand, even apart from these press allegations—which some critics worry could have been planted in order to justify the United States giving up trying to verify the dismantlement of Pyongyang's uranium program in the face of North Korean intransigence—there remains some information in the public record indicating the existence of a uranium effort.

Quite apart from the fact that North Korean First Vice Minister Kang Sok Ju at one point admitted the existence of a uranium enrichment program, Pakistan's then-President Musharraf revealed that the A.Q. Khan proliferation network had provided North Korea with a number of gas centrifuges designed for uranium enrichment.

Additionally, press reports have cited U.S. officials to the effect that evidence obtained in dismantling Libya's WMD programs points toward North Korea as the source for Libya's uranium hexafluoride (UF6) -- which, if true, would mean that North Korea has a uranium conversion facility for producing feedstock for centrifuge enrichment.

Iran

Iran is a party to the NPT, but was found in noncompliance with its NPT safeguards agreement and the status of its nuclear program remains in dispute. In November 2003 IAEA Director General Mohamed ElBaradei reported that Iran had repeatedly and over an extended period failed to meet its safeguards obligations, including by failing to declare its uranium enrichment program.

After about two years of EU3-led diplomatic efforts and Iran temporarily suspending its enrichment program, the IAEA Board of Governors, acting under Article XII.C of the IAEA Statute, found in a rare non-consensus decision with 12 abstentions that these failures constituted non-compliance with the IAEA safeguards agreement.

This was reported to the UN Security Council in 2006, after which the Security Council passed a resolution demanding that Iran suspend its enrichment. Instead, Iran resumed its enrichment program.

The IAEA has been able to verify the non-diversion of declared nuclear material in Iran, and is continuing its work on verifying the absence of undeclared activities. In February 2008, the IAEA also reported that it was working to address "alleged studies" of weaponization, based on documents provided by certain Member States, which those states claimed originated from Iran.

Iran rejected the allegations as "baseless" and the documents as "fabrications." In June 2009, the IAEA reported that Iran had not “cooperated with the Agency in connection with the remaining issues ... which need to be clarified to exclude the possibility of military dimensions to Iran’s nuclear program.” The United States concluded that Iran violated its Article III NPT safeguards obligations, and further argued based on circumstantial evidence that Iran's enrichment program was for weapons purposes and therefore violated Iran's Article II nonproliferation obligations.

The November 2007 US National Intelligence Estimate (NIE) later concluded that Iran had halted an active nuclear weapons program in the fall of 2003 and that it had remained halted as of mid-2007. The NIE's "Key Judgments," however, also made clear that what Iran had actually stopped in 2003 was only "nuclear weapon design and weaponization work and covert uranium conversion-related and uranium enrichment-related work"-namely, those aspects of Iran's nuclear weapons effort that had not by that point already been leaked to the press and become the subject of IAEA investigations.

Since Iran's uranium enrichment program at Natanz—and its continuing work on a heavy water reactor at Arak that would be ideal for plutonium production—began secretly years before in conjunction with the very weaponization work the NIE discussed and for the purpose of developing nuclear weapons, many observers find Iran's continued development of fissile material production capabilities distinctly worrying.

Particularly because fissile material availability has long been understood to be the principal obstacle to nuclear weapons development and the primary "pacing element" for a weapons program, the fact that Iran has reportedly suspended weaponization work may not mean very much. As U.S. Director of National Intelligence Mike McConnell has put it, the aspects of its work that Iran allegedly suspended were thus "probably the least significant part of the program."

Iran states it has a legal right to enrich uranium for peaceful purposes under the NPT, and further says that it "has constantly complied with its obligations under the NPT and the Statute of the International Atomic Energy Agency". Iran also states that its enrichment program is part of its civilian nuclear energy program, which is allowed under Article IV of the NPT. The Non-Aligned Movement has welcomed the continuing cooperation of Iran with the IAEA and reaffirmed Iran's right to the peaceful uses of nuclear technology.

UN Secretary General Ban Ki-moon has welcomed the continued dialogue between Iran and the IAEA, and has called for a peaceful resolution to the issue.

South Africa

South Africa also deserves a special mention as the only country that developed nuclear weapons by itself and later dismantled them - unlike the former Soviet states Ukraine, Belarus and Kazakhstan, which inherited nuclear weapons from the former USSR, and also acceded to the NPT as non-nuclear weapon states.

During the days of apartheid, the white South African government developed a deep fear of both a black uprising and the threat of communism. This led to the development of a secret nuclear weapons program as an ultimate deterrent. South Africa has a large supply of uranium, which is mined in the country's gold mines. The government built a nuclear research facility at Pelindaba near Pretoria where uranium was enriched to fuel grade for the nuclear power plant at Koeberg as well as weapon grade for bomb production.

In 1991, after international pressure and when a change of government was imminent, South African Ambassador to the United States Harry Schwarz signed the Nuclear Non-Proliferation Treaty. In 1993, the then president Frederik Willem de Klerk openly admitted that the country had developed a limited nuclear weapon capability. These weapons were subsequently dismantled prior to accession to the NPT. South Africa then opened itself up to IAEA for inspection. In 1994 the IAEA completed its work and declared that the country had fully dismantled its nuclear weapons program.

Libya

Libya had signed and ratified the Nuclear Non-Proliferation Treaty and was subject to IAEA nuclear safeguards inspections, but undertook a secret nuclear weapons development program in violation of its NPT obligations, using material and technology provided by the A.Q. Khan proliferation network—including actual nuclear weapons designed allegedly originating in China.

Libya began secret negotiations with the United States and the United Kingdom in March 2003 over potentially eliminating its WMD programs. In October 2003, Libya was embarrassed by the interdiction of a shipment of Pakistani-designed centrifuge parts sent from Malaysia, also as part of A. Q. Khan's proliferation ring.

In December 2003, Libya announced that it had agreed to eliminate all its WMD programs, and permitted U.S. and British teams (as well as IAEA inspectors) into the country to assist this process and verify its completion. The nuclear weapons designs, gas centrifuges for uranium enrichment, and other equipment—including prototypes for improved SCUD ballistic missiles—were removed from Libya by the United States.

(Libyan chemical weapons stocks and chemical bombs were also destroyed on site with international verification, with Libya joining the Chemical Weapons Convention.) Libya's noncompliance with its IAEA safeguards was reported to the U.N. Security Council, but with no action taken, as Libya's return to compliance with safeguards and Article II of the NPT was welcomed.

Leaving the treaty

Article X allows a state to leave the treaty if "extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country", giving three months' (ninety days') notice. The state is required to give reasons for leaving the NPT in this notice.

NATO states argue that when there is a state of "general war" the treaty no longer applies, effectively allowing the states involved to leave the treaty with no notice. This is a necessary argument to support the NATO nuclear weapons sharing policy, but a troubling one for the logic of the treaty.

NATO's argument is based on the phrase "the consequent need to make every effort to avert the danger of such a war" in the treaty preamble, inserted at the behest of U.S. diplomats, arguing that the treaty would at that point have failed to fulfill its function of prohibiting a general war and thus no longer be binding. Many states do not accept this argument. See United States-NATO nuclear weapons sharing above.

North Korea has also caused an uproar by its use of this provision of the treaty. Article X.1 only requires a state to give three months' notice in total, and does not provide for other states to question a state's interpretation of "supreme interests of its country".

In 1993, North Korea gave notice to withdraw from the NPT. However, after 89 days, North Korea reached agreement with the United States to freeze its nuclear program under the Agreed Framework and "suspended" its withdrawal notice.

In October 2002, the United States accused North Korea of violating the Agreed Framework by pursuing a secret uranium enrichment program, and suspended shipments of heavy fuel oil under that agreement. In response, North Korea expelled IAEA

inspectors, disabled IAEA equipment, and, on January 10, 2003, announced that it was ending the suspension of its previous NPT withdrawal notification. North Korea said that only one more day's notice was sufficient for withdrawal from the NPT, as it had given 89 days before.

The IAEA Board of Governors rejected this interpretation. Most countries held that a new three-months withdrawal notice was required, and some questioned whether North Korea's notification met the "extraordinary events" and "supreme interests" requirements of the Treaty. The Joint Statement of September 19, 2005 at the end of the Fourth Round of the Six-Party Talks called for North Korea to "return" to the NPT, implicitly acknowledging that it had withdrawn.

Recent and coming events

The 2000 Review Conference had as main outcome the definition in practical terms of the nuclear weapons states' disarmament obligations, summarized in the so called Thirteen Points.

The inclusion of (civilian) nuclear power in the July 2005 Asia-Pacific Partnership for Clean Development and Climate was politically sensitive, as India, which tested its first atomic bomb in 1974, refused to sign the NPT. Prior to the announcement of the Asia-Pacific Partnership, on 18 July 2005, US President George W. Bush had met Indian Prime Minister Manmohan Singh and declared that he would work to change US law and international rules to permit trade in US civilian nuclear technology with India.

Some, such as British columnist George Monbiot, argue that the U.S.-India nuclear deal, in combination with US attempts to deny Iran (an NPT signatory) civilian nuclear fuel-making technology, may destroy the NPT regime, while others[who?] contend that such a move will likely bring India, an NPT non-signatory, under closer international scrutiny.

At the Seventh Review Conference in May 2005, there were stark differences between the United States, which wanted the conference to focus on non-proliferation, especially on its allegations against Iran, and most other countries, who emphasized the lack of serious nuclear disarmament by the nuclear powers. The non-aligned countries reiterated their position that NATO's nuclear sharing arrangement violates the treaty.

The 2010 Review Conference will be held in May 2010 in New York City and is seen as critical to consolidate the nuclear nonproliferation regime, based on the treaty. The 2009 Session of the NPT Preparatory Committee, held in May, failed to deliver an agreed recommendation for the upcoming Review Conference, but even so, it has been considered successful to define the main issues to be discussed during the meeting.

The "Global Summit on Nuclear Security" took place April 12-13, 2010. The summit was proposed by President Obama in Prague and is intended to strengthen the Nuclear Non-Proliferation Treaty in conjunction with the Proliferation Security Initiative and the Global Initiative to Combat Nuclear Terrorism. Forty seven states and three international organizations took part in the Summit, which issued a communiqué and a work plan.

Criticism and responses

Some argue that the NWS have not fully complied, in practice, with their commitments mentioned in NPT. Article VI of the treaty requires NPT parties to "pursue negotiations" on an end to the arms race, "nuclear disarmament, and on a treaty on general and complete disarmament." Yet thousands of nuclear weapons remain, some on high alert, long after the end of the cold war. In January 2002, a report by the Defense Department following the U.S. Nuclear Posture Review recommended the development of nuclear weapons designed to destroy hardened and deeply-buried targets, but the resulting Robust Nuclear Earth Penetrator never gained full Congressional support and was canceled in 2005.

The representative of Ghana, on behalf of the Non-Aligned Movement and the African Group said disarmament and non-proliferation were complementary and mutually reinforcing and that, "Without tangible progress in disarmament, the current emphasis on non-proliferation cannot be sustained."

The United States responds to criticism of its disarmament record by pointing out that since the end of the Cold War it has eliminated over 13,000 nuclear weapons and eliminated over 80% of its deployed strategic warheads and 90% of non-strategic warheads deployed to NATO, in the processing eliminating whole categories of warheads and delivery systems and reducing its reliance on nuclear weapons.

U.S. officials have also pointed out the United States' ongoing—and, throughout 2007, sharply accelerating work to dismantle nuclear warheads. When current accelerated dismantlement efforts ordered by President George W. Bush have been completed, the U.S. arsenal will be less than a quarter of its size at the end of the Cold War, and smaller than it has been at any point since the Eisenhower administration, well before the drafting of the NPT.

The United States has also purchased many thousands of weapons' worth of uranium formerly in Soviet nuclear weapons for conversion into reactor fuel. (As a consequence of this latter effort, it has been estimated that the equivalent of one lightbulb in every ten in the United States is powered by nuclear fuel removed from warheads previously targeted at the United States and its allies during the Cold War.) The U.S. Special Representative for Nuclear Nonproliferation agreed that nonproliferation and disarmament are linked, noting that they can be mutually reinforcing but also that growing proliferation risks create an environment that makes disarmament more difficult.

The United Kingdom, France and Russia likewise defend their nuclear disarmament records, and the five NPT NWS issued a joint statement in 2008 reaffirming their Article VI disarmament commitments. As discussed above, the precise nature of nuclear weapons state obligations, if any, under Article VI of the Treaty is sharply contested.

Comprehensive Nuclear-Test-Ban Treaty

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) bans all nuclear explosions in all environments, for military or civilian purposes. It was adopted by the United Nations General Assembly on 10 September 1996 but it has not yet entered into force.

The Treaty was adopted by the United Nations General Assembly on 10 September 1996. It opened for signature in New York on 24 September 1996, when it was signed by 71 States, including five of the eight then nuclear-capable states. As of November 2009, 151 states have ratified the CTBT and another 31 states have signed but not yet ratified it.

The treaty will enter into force 180 days after the 44 states listed in Annex 2 of the treaty have ratified it. These "Annex 2 states" are states that participated in the CTBT's negotiations between 1994 and 1996 and possessed nuclear power reactors or research reactors at that time. As of April 2009, nine Annex 2 states have not ratified the treaty: China, Egypt, Indonesia, Iran, Israel and the United States have already signed the Treaty, whereas India, North Korea and Pakistan have not yet signed it.

Obligations

(Article I): 1. Each State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.

2. Each State Party undertakes, furthermore, to refrain from causing, encouraging, or in any way participating in the carrying out of any nuclear weapon test explosion or any other nuclear explosion.

History

Arms control advocates had campaigned for the adoption of a treaty banning all nuclear explosions since the early 1950s, when public concern was aroused as a result of radioactive fall-out from atmospheric nuclear tests and the escalating arms race.

Over 50 nuclear explosions were registered between 16 July 1945, when the first nuclear explosive test was conducted by the United States at Alamogordo, New Mexico, and 31 December 1953. Prime Minister Nehru of India voiced the heightened international concern in 1954, when he proposed the elimination of all nuclear test explosions worldwide. However, within the context of the Cold War, skepticism about the capability to verify compliance with a comprehensive nuclear test ban treaty posed a major obstacle to any agreement.

Partial Test Ban Treaty, 1963

Limited success was achieved with the signing of the Partial Test Ban Treaty in 1963, which banned nuclear tests in the atmosphere, underwater and in space. Neither France nor China signed the PTBT. However, the treaty was ratified 80 to 19, and signed by President JFK.

Nuclear Non-proliferation Treaty, 1968

A major step towards non-proliferation of nuclear weapons came with the signing of the Nuclear Non-proliferation Treaty (NPT) in 1968. Under the NPT, non-nuclear weapon states were prohibited from, inter alia, possessing, manufacturing or acquiring nuclear weapons or other nuclear explosive devices.

All signatories, including nuclear weapon states, were committed to the goal of total nuclear disarmament. However, nations like India have not ratified the NPT on grounds that such a treaty is fundamentally discriminatory as it places limitations on states that do not have nuclear weapons while making no efforts to curb weapons development by declared nuclear weapons states.

Negotiations for the CTBT

Given the political situation prevailing in the subsequent decades, little progress was made in nuclear disarmament until 1991. Parties to the PTBT held an amendment conference that year to discuss a proposal to convert the Treaty into an instrument banning all nuclear-weapon tests; with strong support from the UN General Assembly, negotiations for a comprehensive test-ban treaty began in 1993.

Adoption of the CTBT, 1996

Intensive efforts were made over the next three years to draft the Treaty text and its two annexes. However, the Conference on Disarmament, in which negotiations were being held, did not succeed in reaching consensus on the adoption of the text.

Under the direction of Prime Minister John Howard and Foreign Minister Alexander Downer Australia then sent the text to the United Nations General Assembly in New York, where it was submitted as a draft resolution. On 10 September 1996, the Comprehensive Test-Ban Treaty (CTBT) was adopted by a large majority, exceeding two-thirds of the General Assembly's Membership.

US ratification of the CTBT

The US has signed the CTBT, but not ratified it. There is ongoing debate whether or not the US should ratify the CTBT.

The CTBT for the United States is conditioned on:

A: The conduct of a Science Based Stockpile Stewardship Program program to ensure a high level of confidence in the safety and reliability of nuclear weapons in the active stockpile, including the conduct of a broad range of effective and continuing experimental programs.

B: The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology which will attract, retain, and ensure the continued application of our human scientific resources to those programs on which continued progress in nuclear technology depends.

C: The maintenance of the basic capability to resume nuclear test activities prohibited by the CTBT should the United States cease to be bound to adhere to this treaty.

D: Continuation of a comprehensive research and development program to improve our treaty monitoring capabilities and operations.

E: The continuing development of a broad range of intelligence gathering and analytical capabilities and operations to ensure accurate and comprehensive information on worldwide nuclear arsenals, nuclear weapons development programs, and related nuclear programs.

F: The understanding that if the President of the United States is informed by the Secretary of Defense and the Secretary of Energy (DOE) -- advised by the Nuclear Weapons Council, the Directors of DOE's nuclear weapons laboratories and the Commander of the U.S.

Strategic Command -- that a high level of confidence in the safety or reliability of a nuclear weapon type which the two Secretaries consider to be critical to the U.S. nuclear deterrent could no longer be certified, the President, in consultation with Congress, would be prepared to withdraw from the CTBT under the standard "supreme national interests" clause in order to conduct whatever testing might be required.

Proponents of ratification claim that it would : 1. Establish an international norm that would push other nuclear-capable countries like North Korea, Pakistan, and India to sign.

2. Constrain worldwide nuclear proliferation by vastly limiting a country's ability to make nuclear advancements that only testing can ensure.

3. Not compromise US national security because the Science Based Stockpile Stewardship Program serves as a means for maintaining current US nuclear capabilities without physical detonation.

On 13 October 1999, the United States Senate rejected ratification of the CTBT. President Barack Obama stated during his 2008 election campaign that "As president, I will reach out to the Senate to secure the ratification of the CTBT at the earliest practical date."

Monitoring of the CTBT

Geophysical and other technologies are used to monitor for compliance with the Treaty: seismology, hydroacoustics, infrasound, and radionuclide monitoring. The technologies are used to monitor the underground, the waters and the atmosphere for any sign of a nuclear explosion. Statistical theories and methods are integral to CTBT monitoring providing confidence in verification analysis. Once the Treaty enters into force, on site inspection will be provided for where concerns about compliance arise.

The Preparatory Commission for the Comprehensive Test Ban Treaty Organization (CTBTO), an international organization headquartered in Vienna, Austria, was created to build the verification regime, including establishment and provisional operation of the network of monitoring stations, the creation of an international data centre, and development of the On Site Inspection capability.

The monitoring network consists of 337 facilities located all over the globe. As of September 2009, close to 250 facilities have been certified. The monitoring stations register data that is transmitted to the international data centre in Vienna for processing and analysis. The data is sent to states that have signed the Treaty.

Threshold Test Ban Treaty

The Treaty on the Limitation of Underground Nuclear Weapon Tests, also known as the Threshold Test Ban Treaty (or TTBT), was signed in July

1974 by the USA and the USSR. It establishes a nuclear "threshold," by prohibiting nuclear tests of devices having a yield exceeding 150 kilotons (equivalent to 150,000 tons of TNT).

The threshold is militarily important since it removes the possibility of testing new or existing nuclear weapons going beyond the fractional-megaton range. In the 1960s, many tests above 150 kilotons were conducted by both countries. The mutual restraint imposed by the Treaty reduced the explosive force of new nuclear warheads and bombs which could otherwise be tested for weapons systems.

Of particular significance was the relationship between explosive power of reliable, tested warheads and first-strike capability. Agreement on the Threshold Test Ban Treaty was reached during the summit meeting in Moscow in July 1974.

Provisions

The treaty included a protocol which detailed technical data to be exchanged and which limited weapon testing to specific designated test sites to assist verification. The data to be exchanged included information on the geographical boundaries and geology of the testing areas.

Geological data -- including such factors as density of rock formation, water saturation, and depth of the water table -- are useful in verifying test yields because the seismic signal produced by a given underground nuclear explosion varies with these factors at the test location. After an actual test has taken place, the geographic coordinates of the test location are to be furnished to the other party, to help in placing the test in the proper geological setting and thus in assessing the yield.

The treaty also stipulates that data will be exchanged on a certain number of tests for calibration purposes. By establishing the correlation between stated yields of explosions at the specified sites and the seismic signals produced, this exchange improved assessments by both parties of the yields of nuclear explosions based primarily on the measurements derived from their seismic instruments. The tests used for calibration purposes may be tests conducted in the past or new tests.

Agreement to exchange the detailed data described above represented a significant degree of direct cooperation by the two major nuclear powers in the effort to control nuclear weapons. For the first time, each party agreed to make available to the other data relating to its nuclear weapons test program.

Technical issues

The technical problems associated with a yield threshold were recognized by the sides in the spring of 1974. In this context the Soviet Union mentioned the idea of some kind of a "mistakes" understanding concerning occasional, minor, unintended breaches. Discussions on the subject of such an understanding took place in the autumn of 1974 and in the spring of 1976.

The Soviet Union was informed by the United States that the understanding reached would be included as part of the public record associated with submitting the Treaty to the Senate for advice and consent to ratification. The entire understanding is as follows:

Both Parties will make every effort to comply fully with all the provisions of the TTB Treaty. However, there are technical uncertainties associated with predicting the precise yields of nuclear weapons tests. These uncertainties may result in slight, unintended breaches of the 150 kiloton threshold.

Therefore, the two sides have discussed this problem and agreed that: (1) one or two slight, unintended breaches per year would not be considered a violation of the Treaty; (2) such breaches would be a cause for concern, however, and, at the request of either Party, would be the subject for consultations.

Intermediate-Range Nuclear Forces Treaty

The Intermediate-Range Nuclear Forces Treaty (INF) is a 1987 agreement between the United States and the Soviet Union. Signed in Washington, D.C. by U.S. President Ronald Reagan and General Secretary Mikhail Gorbachev on December 8, 1987, it was ratified by the United States Senate on May 27, 1988 and came into force on June 1 of that year. The treaty is formally titled The Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles.

The treaty eliminated nuclear and conventional ground-launched ballistic and cruise missiles with intermediate ranges, defined as between 500-5,500 km (300-3,400 miles). By the treaty's deadline of June 1, 1991, a total of 2,692 of such weapons had been destroyed, 846 by the U.S. and 1,846 by the Soviet Union, which was much more unequal in number of INF warheads destroyed. Under the treaty both nations were allowed to inspect each other's military installations.

History

The longer range, greater accuracy, mobility and striking power of the new missile was perceived to alter the security of Western Europe. After discussions, NATO agreed to a two part strategy - firstly to pursue arms control negotiations with the Soviet Union to reduce their and the American INF arsenals; secondly to deploy in Europe from 1983 up to 464 ground-launched cruise missiles (GLCM) and 108 Pershing II ballistic missiles.

Until the late 1970s NATO had clear superiority over USSR in INF systems because Soviets possessed only liquid-fueled, single warhead, very inaccurate and easy to destroy IRBMs and a few hundreds equally outdated subsonic heavy bombers of Tu-16 and Tu-22 types.

In contrast, NATO and USAFE had Mirage IV, V-force and brand-new F-111 bombers in addition to French, British, and US precise, solid propelled IRBMs and SLBMs based in Europe and on adjacent waters. So Soviet attempts to close the "INF gap" by SS-20 and Tu-22M deployment was met with NATO moves to secure Western alliance nuclear advantage in Europe thanks to GLCM and Pershing II installation.

Despite dissatisfaction with the deployment of US weapons in Europe, the Soviet Union agreed to open negotiations and preliminary discussions began in Geneva in 1980. Formal talks began in September 1981 with the US "Zero option" offer - the complete elimination of all Pershing, GLCM, SS-20, SS-4 and SS-5 missiles.

Following disagreement over the exclusion of British and French delivery systems, the talks were suspended by the Soviet delegation in November 1983. In 1984, despite public protest, the US began to deploy INF systems in West Germany, Italy, and the United Kingdom.

In March 1986 negotiations between the US and the Soviet Union resumed, covering not only the INF issue but also separate discussions on strategic weapons (START I) and space issues (NST). In late 1985 both sides were moving towards limiting INF systems in Europe and Asia.

On January 15, 1986, Gorbachev announced a Soviet proposal for a ban on all nuclear weapons by 2000, which included INF missiles in Europe. This was dismissed by the US and countered with a phased reduction of INF launchers in Europe and Asia to none by 1989. There would be no constraints on British and French nuclear forces.

A series of meetings in August and September 1986 culminated in the Reykjavík Summit between Reagan and Gorbachev on October 11, 1986. Both agreed in principle to remove INF systems from Europe and to equal global limits of 100 INF missile warheads. Gorbachev also proposed deeper and more fundamental changes in the strategic relationship.

More detailed negotiations extended throughout 1987, aided by the decision of West Geman Chancellor Helmut Kohl in August to unilaterally remove the joint U.S.-West German Pershing IA systems. The treaty text was finally agreed in September 1987.

New START

New START (for STrategic Arms Reduction Treaty) (Russian: ???-III) is a bilateral nuclear arms reduction treaty between the United States and Russia that was signed in 2010. It is a follow-up to the 1991 START I treaty, which expired in December 2009, and to START II and the 2002 Treaty of Moscow (SORT), which was due to expire in December 2012.

Prolonged talks were conducted by U.S. and Russian delegations in Geneva, led on the American side by U.S. State Department Assistant Secretary Rose Gottemoeller. The Russian delegation was headed by Anatoly Antonov, director of security and disarmament at the Russian Ministry of Foreign Affairs. Presidents Barack Obama and Dmitry Medvedev then announced on 26 March 2010 that they had reached an agreement. The new treaty was signed on 8 April 2010 in Prague by Obama and Medvedev.

It will limit the number of operationally deployed nuclear warheads to 1,550, which is down nearly two-thirds from the original START treaty and is 30% lower than the deployed strategic warhead limit of the 2002 Moscow Treaty and it will limit to 800 the number of deployed and non-deployed intercontinental ballistic missile (ICBM) launchers, submarine-launched ballistic missile (SLBM) launchers, and heavy bombers equipped for nuclear armaments. Also it will limit the number of ICBMs, SLBMs, and deployed heavy bombers equipped for nuclear armaments to 700.

These obligations must be met within seven years from the date the new treaty enters into force. The treaty will last ten years, with an option to renew it for up to five years upon agreement of both parties. The treaty first has to be ratified by the United States Senate and the Federation Council of the Russian Federation. Once that is done, the treaty will enter into force on the date of the exchange of instruments of ratification.

The number of operationally inactive stockpiled nuclear warheads will remain in the high thousands in both the Russian and United States inventories.

The number of nuclear missile launchers will be reduced by half. A new inspection and verification regime will be established, replacing the mechanism defined by the earlier treaty.

The new treaty has been described in the press as "substantial".

NPT Review Conference

In May, the 2010 review conference for the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) will be held at United Nations Headquarters in New York.

Context

Three major events occurred prior to the NPT Review Conference:

- The New START treaty was signed on April 8, 2010 in Prague by U.S. President Obama and Russian President Medvedev.
- The Nuclear Security Summit (2010) was held on April 12–13, 2010.
- Iran held the Tehran International Conference on Disarmament and Non-Proliferation, 2010 on April 17–18, 2010.

Participants

A delegation headed by Foreign Minister Manouchehr Mottaki will represent Iran at the conference.

Nuclear disarmament

Nuclear disarmament refers to both the act of reducing or eliminating nuclear weapons and to the end state of a nuclear-free world, in which nuclear weapons are completely eliminated.

Proponents of nuclear disarmament say that it would lessen the probability of nuclear war occurring, especially accidentally. Critics of nuclear disarmament say that it would undermine deterrence.

History

The movement for disarmament has varied from nation to nation over times.

A few prominent proponents of disarmament argued in the earliest days of the Cold War that the creation of an international watchdog organization could be used to enforce a ban against the creation of nuclear weapons. This initial movement largely failed. During the 1960s, a much stronger popular movement against nuclear weapons developed, rallying primarily around the fear of nuclear fallout from nuclear testing.

After the Partial Test Ban Treaty (1963), which prohibited atmospheric testing, the movement against nuclear weapons somewhat subsided in the 1970s (and was replaced in part by a movement against nuclear power). In the 1980s, a popular movement for nuclear disarmament again gained strength in the light of the weapons build-up and aggressive rhetoric of US President Ronald Reagan. After the end of the Cold War in the early 1990s the momentum again faded.

In the USSR, voices against nuclear weapons were few and far between as there was no "public" to speak of as a political factor. Certain citizens who had become prominent enough to safely criticize the Soviet government, such as Andrei Sakharov, did speak out against nuclear weapons, but to little effect.

When the extreme danger intrinsic to nuclear war and the possession of nuclear weapons became apparent to all sides during the Cold War, a series of disarmament and nonproliferation treaties were agreed upon between the United States, the Soviet Union, and several other states throughout the world. Many of these treaties involved years of negotiations, and seemed to result in important steps toward creating a nuclear weapons free world.

Key treaties

Partial Test Ban Treaty (PTBT) - 1963: Prohibited all testing of nuclear weapons except underground.

Nuclear Non-Proliferation Treaty (NPT) - signed 1968, came into force 1970: An international treaty (currently with 189 member states) to limit the spread of nuclear weapons. The treaty has three main pillars: nonproliferation, disarmament, and the right to peacefully use nuclear technology.

Interim Agreement on Offensive Arms (SALT I) - 1972: The Soviet Union and the United States agreed to a freeze in the number of intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs) that they would deploy.

Anti-Ballistic Missile Treaty (ABM) - 1972: The United States and Soviet Union could deploy ABM interceptors at two sites, each with up to 100 ground-based launchers for ABM interceptor missiles. In a 1974 Protocol, the US and Soviet Union agreed to only deploy an ABM system to one site.

Strategic Arms Limitation Treaty (SALT II) - 1979: Replacing SALT I, SALT II limited both the Soviet Union and the United States to an equal number of ICBM launchers, SLBM launchers, and heavy bombers. Also placed limits on Multiple Independent Reentry Vehicles (MIRVS).

Intermediate-Range Nuclear Forces Treaty (INF) - 1987: Created a global ban on short- and long-range nuclear weapons systems, as well as an intrusive verification regime.

Strategic Arms Reduction Treaty (START I) - signed 1991, ratified 1994: Limited long-range nuclear forces in the United States and the newly independent states of the former Soviet Union to 6,000 attributed warheads on 1,600 ballistic missiles and bombers.

Strategic Arms Reduction Treaty II (START II) - signed 1993, never put into force: START II was a bilateral agreement between the US and Russia which attempted to commit each side to deploy no more than 3,000 to 3,500 warheads by December 2007 and also included a prohibition against deploying multiple independent reentry vehicles (MIRVs) on intercontinental ballistic missiles (ICBMs)

Strategic Offensive Reductions Treaty (SORT or Moscow Treaty) - signed 2002, into force 2003: A very loose treaty that is often criticized by arms control advocates for its ambiguity and lack of depth, Russia and the United States agreed to reduce their "strategic nuclear warheads" (a term that remain undefined in the treaty) to between 1,700 and 2,200 by 2012.

Comprehensive Test Ban Treaty (CTBT) - signed 1996, not yet in force: The CTBT is an international treaty (currently with 181 state signatures and 148 state ratifications) that bans all nuclear explosions in all environments. While the treaty is not in force, Russia has not tested a nuclear weapon since 1990 and the United States has not since 1992.

New START Treaty - signed 2010, not yet ratified by either Russia or the United States.

Only one country has been known to ever dismantle their nuclear arsenal completely—the apartheid government of South Africa apparently developed half a dozen crude fission weapons during the 1980s, but they were dismantled in the early 1990s.

NATO's European theatre

After the fall of the Soviet Union, a number of former Soviet republics (Belarus, Ukraine, and Kazakhstan) found themselves in possession of Soviet nuclear weapons, but they were given to Russia (who took responsibility and ownership of the Soviet arsenal) in exchange for negative security assurances and financial compensation from the United States and the Russian Federation.

As part of an effort to reduce nuclear tensions between US and Russia after the end of the Cold War, a delegation from the Russian Ministry of Defence led by US-Russian national Alexander M. Dokychuk, during an official visit to the US in 1992, stated in a live televised program that Russian nuclear missiles will never again be pointed at US cities.

Organizations

Many organizations and networks exist which distribute information and put pressure on governments, e.g. the Campaign for Nuclear Disarmament (CND), which advocated a policy of unilateral nuclear disarmament in the United Kingdom together with the Labour far left, specifically the Bevanites, leading it to become Labour Party policy in 1960-61 and again in 1980-89.

There was also a strong peace camp movement. Many people still felt the need for a nuclear deterrent, especially since the Cold War was still ongoing, and this policy is believed to have been a major cause of Labour's defeat in the 1983 election.

In 1955, 11 leading scientists and intellectuals signed the Russell-Einstein Manifesto, warning of the dangers posed by nuclear weapons and calling on world leaders to find peaceful solutions to international tensions. This was followed in 1957 by the first of the Pugwash Conferences on Science and World Affairs hosted by Cyrus S. Eaton in Pugwash, Nova Scotia.

The 1985 Nobel peace prize-winning International Physicians for the Prevention of Nuclear War (IPPNW) advocates abolition of all nuclear weapons. In 2006, it initiated the International Campaign to Abolish Nuclear Weapons.

The Council for a Livable World, founded by nuclear physicist Leo Szilard, and its sister organization, the Center for Arms Control and Non-Proliferation, have both advocated for a reduction in global nuclear stockpiles and for an increase in non proliferation efforts.

In the U.S. an organization for nuclear disarmament is Peace Action - National Committee for a Sane Nuclear Policy.

US nuclear policy

Despite a general trend toward disarmament in the early 1990s, the George W. Bush administration repeatedly pushed to fund policies that would allegedly make nuclear weapons more usable in the post-Cold War environment. To date the U.S. Congress has refused to fund many of these policies. However, some feel that even considering such programs harms the credibility of the United States as a proponent of nonproliferation.

Recent controversial U.S. nuclear policies

Reliable Replacement Warhead Program (RRW): This program seeks to replace existing warheads with a smaller number of warhead types designed to be easier to maintain without testing. Critics charge that this would lead to a new generation of nuclear weapons and would increase pressures to test. Congress has not funded this program.

Complex Transformation: Complex transformation, formerly know as Complex 2030, is an effort to shrink the U.S. nuclear weapons complex and restore the ability to produce "pits" the fissile cores of the primaries of U.S. thermonuclear weapons. Critics see it as an upgrade to the entire nuclear weapons complex to support the production and maintenance of the new generation of nuclear weapons. Congress has not funded this program.

Nuclear bunker buster: Formally knows as the Robust Nuclear Earth Penetrator (RNEP), this program aimed to modify an existing gravity bomb to penetrate into soil and rock in order to destroy underground targets. Critics argue that this would lower the threshold for use of nuclear weapons. Congress did not fund this proposal, which was later withdrawn.

Missile Defense: Formerly known as National Missile Defense, this program seeks to build a network of interceptor missiles to protect the United States and its allies from incoming missiles, including nuclear-armed missiles. Critics have argued that this would impede nuclear disarmament and possibly stimulate a nuclear arms race. Elements of missile defense are being deployed in Poland and the Czech Republic, despite Russian opposition.

Former U.S. officials Henry Kissinger, George Shultz, Bill Perry and Sam Nunn proposed in January 2007 that the United States rededicate itself to the goal of eliminating nuclear weapons, concluding: "We endorse setting the goal of a world free of nuclear weapons and working energetically on the actions required to achieve that goal." Arguing a year later that "with nuclear weapons more widely available, deterrence is decreasingly effective and increasingly hazardous," the authors concluded that although "it is tempting and easy to say we can't get there from here, . . . we must chart a course" toward that goal. During his Presidential campaign, U.S. President Elect Barack Obama pledged to "set a goal of a world without nuclear weapons, and pursue it."

U.S. policy options for nuclear terrorism

The United States has taken the lead in ensuring that nuclear materials globally are properly safeguarded. A popular program that has received bipartisan domestic support for over a decade is the Cooperative Threat Reduction Program (CTR). While this program has been deemed a success, its funding levels need to be increased so as to ensure that all dangerous nuclear materials are secured in the most expeditious manner possible.

The CTR program has led to several other innovative and important nonproliferation programs that need to continue to be a budget priority in order to ensure that nuclear weapons do not spread to actors hostile to the United States.

Key programs

Cooperative Threat Reduction (CTR): The CTR program provides funding to help Russia secure materials that might be used in nuclear or chemical weapons as well as to dismantle weapons of mass destruction and their associated infrastructure in Russia.

Global Threat Reduction Initiative (GTRI): Expanding on the success of the CTR, the GTRI will expand nuclear weapons and material securing and dismantlement activities to states outside of the former Soviet Union.

Other states

While the vast majority of states have adhered to the stipulations of the Nuclear Nonproliferation Treaty, a few states have either refused to sign the treaty or have pursued nuclear weapons programs while not being members of the treaty.

Many view the pursuit of nuclear weapons by these states as a threat to nonproliferation and world peace, and therefore seek policies to discourage the spread of nuclear weapons to these states, a few of which are often described by the US as "rogue states".

Declared nuclear weapon states not party to the NPT:

- Indian nuclear weapons - 60-80 active warheads.
- Pakistani nuclear weapons - 70-90 active warheads
- North Korean nuclear weapons - <10 active warheads

Undeclared nuclear weapon states not party to the NPT:
Israeli nuclear weapons - 75 - 200 active warheads

Nuclear weapon states not party to the NPT that disarmed and joined the NPT as non-nuclear weapons states:

South African nuclear weapons - disarmed from 1989-1993

Former Soviet states that disarmed and joined the NPT as non-nuclear weapons states:

- Belarus
- Kazakhstan
- Ukraine

Non-nuclear weapon states party to the NPT currently accused of seeking nuclear weapons:

Iranian nuclear weapons program

Non-nuclear weapon states party to the NPT who acknowledged and eliminated past nuclear weapons programs:

- Libyan nuclear weapons program
- Nuclear proliferation

Nuclear proliferation is a term now used to describe the spread of nuclear weapons, fissile material, and weapons-applicable nuclear technology and information, to nations which are not recognized as "Nuclear Weapon States" by the Treaty on the Nonproliferation of Nuclear Weapons, also known as the Nuclear Nonproliferation Treaty or NPT.

Proliferation has been opposed by many nations with and without nuclear weapons, the governments of which fear that more countries with nuclear weapons may increase the possibility of nuclear warfare (up to and including the so-called "countervalue" targeting of civilians with nuclear weapons), de-sta-

bilize international or regional relations, or infringe upon the national sovereignty of states.

Four nations besides the five recognized Nuclear Weapons States, none of which signed or ratified the NPT, have acquired, or are presumed to have acquired, nuclear weapons: India, Pakistan, North Korea, and Israel. One critique of the NPT is that it is discriminatory in recognizing as nuclear weapon states only those counties that tested nuclear weapons before 1968 and requiring all other states joining the treaty to forswear nuclear weapons.

Nuclear proliferation

Research into the development of nuclear weapons was undertaken during World War II by the United States, the United Kingdom, Germany, Japan, and the USSR. The United States was the first and is the only country to have used a nuclear weapon in war, when it used two bombs against Japan in August 1945.

With their loss during the war, Germany and Japan ceased to be involved in any nuclear weapon research. In August 1949, the USSR tested a nuclear weapon. The United Kingdom tested a nuclear weapon in October 1952. France developed a nuclear weapon in 1960. The People's Republic of China detonated a nuclear weapon in 1964. India exploded a nuclear device in 1974, and Pakistan tested a weapon in 1998. In 2006, North Korea conducted a nuclear test.

Non-proliferation efforts

Early efforts to prevent nuclear proliferation involved intense government secrecy, the wartime acquisition of known uranium stores (the Combined Development Trust), and at times even outright sabotage—such as the bombing of a heavy-water facility thought to be used for a German nuclear program. None of these efforts were explicitly public, owing to the fact that the weapon developments themselves were kept secret until the bombing of Hiroshima.

Earnest international efforts to promote nuclear non-proliferation began soon after World War II, when the Truman Administration proposed the Baruch Plan of 1946, named after Bernard Baruch, America's first representative to the United Nations Atomic Energy Commission. The Baruch Plan, which drew heavily from the Acheson-Lilienthal Report of 1946, proposed the verifiable dismantlement and destruction of the U.S. nuclear arsenal (which, at that time, was the only nuclear arsenal in the world) after all governments had cooperated successfully to accomplish two things:

(1) the establishment of an "international atomic development authority," which would actually own and control all military-applicable nuclear materials and activities, and

(2) the creation of a system of automatic sanctions, which not even the U.N. Security Council could veto, and which would proportionately punish states attempting to acquire the capability to make nuclear weapons or fissile material.

Although the Baruch Plan enjoyed wide international support, it failed to emerge from the UNAEC because the Soviet Union planned to veto it in the Security Council. Still, it remained official American policy until 1953, when President Eisenhower made his "Atoms for Peace" proposal before the U.N. General Assembly.

Eisenhower's proposal led eventually to the creation of the International Atomic Energy Agency (IAEA) in 1957. Under the "Atoms for Peace" program thousands of scientists from around the world were educated in nuclear science and then dispatched home, where many later pursued secret weapons programs in their home country.

Efforts to conclude an international agreement to limit the spread of nuclear weapons did not begin until the early 1960s, after four nations (the United States, the Soviet Union, Britain and France) had acquired nuclear weapons.

Although these efforts stalled in the early 1960s, they renewed once again in 1964, after China detonated

a nuclear weapon. In 1968, governments represented at the Eighteen Nation Disarmament Committee (ENDC) finished negotiations on the text of the NPT.

In June 1968, the U.N. General Assembly endorsed the NPT with General Assembly Resolution 2373 (XXII), and in July 1968, the NPT opened for signature in Washington, DC, London and Moscow. The NPT entered into force in March 1970.

Since the mid-1970s, the primary focus of non-proliferation efforts has been to maintain, and even increase, international control over the fissile material and specialized technologies necessary to build such devices because these are the most difficult and expensive parts of a nuclear weapons program.

The main materials whose generation and distribution is controlled are highly enriched uranium and plutonium. Other than the acquisition of these special materials, the scientific and technical means for weapons construction to develop rudimentary, but working, nuclear explosive devices are considered to be within the reach of industrialized nations.

Since its founding by the United Nations in 1957, the International Atomic Energy Agency (IAEA) has promoted two, sometimes contradictory, missions: on the one hand, the Agency seeks to promote and spread internationally the use of civilian nuclear energy; on the other hand, it seeks to prevent, or at least detect, the diversion of civilian nuclear energy to nuclear weapons, nuclear explosive devices or purposes unknown.

The IAEA now operates a safeguards system as specified under Article III of the Nuclear Non-Proliferation Treaty (NPT) of 1968, which aims to ensure that civil stocks of uranium, plutonium, as well as facilities and technologies associated with these nuclear materials, are used only for peaceful purposes and do not contribute in any way to proliferation or nuclear weapons programs.

Dual use technology

Dual use technology refers to the possibility of military use of civilian nuclear power technology.

The enriched uranium used in most nuclear reactors is not concentrated enough to build a bomb. Most nuclear reactors run on 4% enriched uranium; Little Boy used 80% enriched uranium; while lower enrichment levels could be used, the minimum bomb size would rapidly become unfeasibly large as the level was decreased. However, the same plants and technology used to enrich uranium for power generation can be used to make the highly enriched uranium needed to build a bomb.

In addition, the plutonium produced in power reactors, if separated from spent fuel through chemical reprocessing (much less technically challenging than isotopic separation), can be used for a bomb. While the plutonium resulting from normal reactor fueling cycles is less than ideal for weapons use because of the concentration of Pu-240, a usable weapon can be produced from it.

If the reactor is operated on very short fueling cycles, bomb-grade plutonium can be produced. However, such operation would be virtually impossible to camouflage in many reactor designs, as the frequent shutdowns for refueling would be obvious, for instance in satellite photographs.

Fast breeder reactors require reprocessing, generate more plutonium than they consume (and more than non-breeders), and can produce better than weapons-grade plutonium. New technology for breeder reactors, like SSTAR, may lessen the risk of nuclear proliferation by providing sealed reactors with a limited self-contained fuel supply that could be remotely shut down in case of tampering.

International cooperation

Nuclear Non-Proliferation Treaty

At present, 189 countries are States Parties to the Treaty on the Nonproliferation of Nuclear Weapons, more commonly known as the Nuclear Non-proliferation Treaty or NPT. These include the five Nuclear Weapons States (NWS) recognized by the NPT: the People's Republic of China, France, Russian Federation, the UK, and the United States.

Notable non-signatories to the NPT are Israel, Pakistan, and India (the latter two have since tested nuclear weapons, while Israel is considered by most to be an unacknowledged nuclear weapons state).

North Korea was once a signatory but withdrew in January 2003. The legality of North Korea's withdrawal is debatable but as of 9 October 2006, North Korea clearly possesses the capability to make a nuclear explosive device.

International Atomic Energy Agency

The IAEA was established on 29 July 1957 to help nations develop nuclear energy for peaceful purposes. Allied to this role is the administration of safeguards arrangements to provide assurance to the international community that individual countries are honoring their commitments under the treaty. Though established under its own international treaty, the IAEA reports to both the United Nations General Assembly and the Security Council.

The IAEA regularly inspects civil nuclear facilities to verify the accuracy of documentation supplied to it. The agency checks inventories, and samples and analyzes materials. Safeguards are designed to deter diversion of nuclear material by increasing the risk of early detection. They are complemented by controls on the export of sensitive technology from countries such as UK and United States through voluntary bodies such as the Nuclear Suppliers Group.

The main concern of the IAEA is that uranium not be enriched beyond what is necessary for commercial civil plants, and that plutonium which is produced by nuclear reactors not be refined into a form that would be suitable for bomb production.

Scope of safeguards

Traditional safeguards are arrangements to account for and control the use of nuclear materials. This verification is a key element in the international system which ensures that uranium in particular is used only for peaceful purposes.

Parties to the NPT agree to accept technical safeguard measures applied by the IAEA. These require that operators of nuclear facilities maintain and declare detailed accounting records of all movements and transactions involving nuclear material.

Over 550 facilities and several hundred other locations are subject to regular inspection, and their records and the nuclear material being audited. Inspections by the IAEA are complemented by other measures such as surveillance cameras and instrumentation.

The inspections act as an alert system providing a warning of the possible diversion of nuclear material from peaceful activities. The system relies on;

1. Material Accountancy - tracking all inward and outward transfers and the flow of materials in any nuclear facility. This includes sampling and analysis of nuclear material, on-site inspections, and review and verification of operating records.

2. Physical Security - restricting access to nuclear materials at the site.

3. Containment and Surveillance - use of seals, automatic cameras and other instruments to detect unreported movement or tampering with nuclear materials, as well as spot checks on-site.

All NPT non-weapons states must accept these full-scope safeguards. In the five weapons states plus the non-NPT states (India, Pakistan and Israel), facility-specific safeguards apply. IAEA inspectors regularly visit these facilities to verify completeness and accuracy of records.

The terms of the NPT cannot be enforced by the IAEA itself, nor can nations be forced to sign the treaty. In reality, as shown in Iraq and North Korea, safeguards can be backed up by diplomatic, political and economic measures.

While traditional safeguards easily verified the correctness of formal declarations by suspect states, in the 1990s attention turned to what might not have been declared. While accepting safeguards at declared facilities, Iraq had set up elaborate equipment elsewhere in an attempt to enrich uranium to weapons grade.

North Korea attempted to use research reactors (not commercial electricity-generating reactors) and a reprocessing plant to produce some weapons-grade plutonium.

The weakness of the NPT regime lay in the fact that no obvious diversion of material was involved. The uranium used as fuel probably came from indigenous sources, and the nuclear facilities were built by the countries themselves without being declared or placed under safeguards. Iraq, as an NPT party, was obliged to declare all facilities but did not do so.

Nevertheless, the activities were detected and brought under control using international diplomacy. In Iraq, a military defeat assisted this process.

In North Korea, the activities concerned took place before the conclusion of its NPT safeguards agreement. With North Korea, the promised provision of commercial power reactors appeared to resolve the situation for a time, but it later withdrew from the NPT and declared it had nuclear weapons.

Additional Protocol

In 1993 a program was initiated to strengthen and extend the classical safeguards system, and a model protocol was agreed by the IAEA Board of Governors 1997. The measures boosted the IAEA's ability to detect undeclared nuclear activities, including those with no connection to the civil fuel cycle.

Innovations were of two kinds. Some could be implemented on the basis of IAEA's existing legal authority through safeguards agreements and inspections. Others required further legal authority to be conferred through an Additional Protocol.

This must be agreed by each non-weapons state with IAEA, as a supplement to any existing comprehensive safeguards agreement. Weapons states have agreed to accept the principles of the model additional protocol.

Key elements of the model Additional Protocol: The IAEA is to be given considerably more information on nuclear and nuclear-related activities, including R & D, production of uranium and thorium (regardless of whether it is traded), and nuclear-related imports and exports.

IAEA inspectors will have greater rights of access. This will include any suspect location, it can be at short notice (e.g., two hours), and the IAEA can deploy environmental sampling and remote monitoring techniques to detect illicit activities.

States must streamline administrative procedures so that IAEA inspectors get automatic visa renewal and can communicate more readily with IAEA headquarters.

Further evolution of safeguards is towards evaluation of each state, taking account of its particular situation and the kind of nuclear materials it has. This will involve greater judgement on the part of IAEA and the development of effective methodologies which reassure NPT States.

As of 9 October 2008, 127 countries have signed Additional protocols, and 88 have brought them into force. The IAEA is also applying the measures of the Additional Protocol in Taiwan. Among the leading countries that have not signed the Additional Protocol are Egypt, which says it will not sign until Israel accepts comprehensive IAEA safeguards, and Brazil, which opposes making the protocol a requirement for international cooperation on enrichment and reprocessing, but has not ruled out signing.

Limitations of Safeguards

The greatest risk from nuclear weapons proliferation comes from countries which have not joined the NPT and which have significant unsafeguarded nuclear activities; India, Pakistan, and Israel fall within this category. While safeguards apply to some of their activities, others remain beyond scrutiny.

A further concern is that countries may develop various sensitive nuclear fuel cycle facilities and research reactors under full safeguards and then subsequently opt out of the NPT.

Bilateral agreements, such as insisted upon by Australia and Canada for sale of uranium, address this by including fallback provisions, but many countries are outside the scope of these agreements. If a nuclear-capable country does leave the NPT, it is likely to be reported by the IAEA to the UN Security Council, just as if it were in breach of its safeguards agreement. Trade sanctions would then be likely.

IAEA safeguards, together with bilateral safeguards applied under the NPT can, and do, ensure that uranium supplied by countries such as Australia and Canada does not contribute to nuclear weapons proliferation. In fact, the worldwide application of those safeguards and the substantial world trade in uranium for nuclear electricity make the proliferation of nuclear weapons much less likely.

The Additional Protocol, once it is widely in force, will provide credible assurance that there are no undeclared nuclear materials or activities in the states concerned. This will be a major step forward in preventing nuclear proliferation.

Other developments

The Nuclear Suppliers Group communicated its guidelines, essentially a set of export rules, to the IAEA in 1978. These were to ensure that transfers of nuclear material or equipment would not be diverted to unsafeguarded nuclear fuel cycle or nuclear explosive activities, and formal government assurances to this effect were required from recipients.

The Guidelines also recognised the need for physical protection measures in the transfer of sensitive facilities, technology and weapons-usable materials, and strengthened retransfer provisions. The group began with seven members – the United States, the former USSR, the UK, France, Germany, Canada and Japan – but now includes 46 countries including all five nuclear weapons states.

According to Kenneth D. Bergeron's Tritium on Ice: The Dangerous New Alliance of Nuclear Weapons and Nuclear Power, tritium is not classified as a 'special nuclear material' but rather as a 'by-product'. It is seen as an important litmus test on the seriousness of the United States' intention to nuclear disarm.

This radioactive super-heavy hydrogen isotope is used to boost the efficiency of fissile materials in nuclear weapons. The United States resumed tritium production in 2003 for the first time in 15 years. This could indicate that there is a potential nuclear arm stockpile replacement since the isotope naturally decays.

In May 1995, NPT parties reaffirmed their commitment to a Fissile Materials Cut-off Treaty to prohibit the production of any further fissile material for weapons. This aims to complement the Comprehensive Test Ban Treaty of 1996 and to codify commitments made by the United States, the UK, France and Russia to cease production of weapons material, as well as putting a similar ban on China. This treaty will also put more pressure on Israel, India and Pakistan to agree to international verification.

On 9 August 2005, Ayatollah Ali Khamenei issued a fatwa forbidding the production, stockpiling and use of nuclear weapons. Khamenei's official statement was made at the meeting of the International Atomic Energy Agency (IAEA) in Vienna. As of February 2006 Iran formally announced that ura-

nium enrichment within their borders has continued. Iran claims it is for peaceful purposes but the United Kingdom, France, Germany, and the United States claim the purpose is for nuclear weapons research and construction.

Unsanctioned Nuclear Activity

Non-signatory States

India, Pakistan and Israel have been "threshold" countries in terms of the international non-proliferation regime. They possess or are quickly capable of assembling one or more nuclear weapons. They have remained outside the 1970 NPT. They are thus largely excluded from trade in nuclear plant or materials, except for safety-related devices for a few safeguarded facilities.

In May 1998 India and Pakistan each exploded several nuclear devices underground. This heightened concerns regarding an arms race between them, with Pakistan involving the People's Republic of China, an acknowledged nuclear weapons state. Both countries are opposed to the NPT as it stands, and India has consistently attacked the Treaty since its inception in 1970 labeling it as a lopsided treaty in favor of the nuclear powers.

Relations between the two countries are tense and hostile, and the risks of nuclear conflict between them have long been considered quite high. Kashmir is a prime cause of bilateral tension, its sovereignty being in dispute since 1948. There is persistent low level military conflict due to Pakistan backing an insurgency there and the disputed status of Kashmir.

Both engaged in a conventional arms race in the 1980s, including sophisticated technology and equipment capable of delivering nuclear weapons. In the 1990s the arms race quickened. In 1994 India reversed a four-year trend of reduced allocations for defence, and despite its much smaller economy, Pakistan was expected to push its own expenditures yet higher.

Both have lost their patrons: India, the former USSR, and Pakistan, the United States.

But it is the growth and modernization of China's nuclear arsenal and its assistance with Pakistan's nuclear power programme and, reportedly, with missile technology, which exacerbate Indian concerns. In particular, Pakistan is aided by China's People's Liberation Army, which operates somewhat autonomously within that country as an exporter of military material.

India

Nuclear power for civil use is well established in India. Its civil nuclear strategy has been directed towards complete independence in the nuclear fuel cycle, necessary because of its outspoken rejection of the NPT.

This self-sufficiency extends from uranium exploration and mining through fuel fabrication, heavy water production, reactor design and construction, to reprocessing and waste management. It has a small fast breeder reactor and is planning a much larger one. It is also developing technology to utilise its abundant resources of thorium as a nuclear fuel.

India has 14 small nuclear power reactors in commercial operation, two larger ones under construction, and ten more planned. The 14 operating ones (2548 MWe total) comprise:

Two 150 MWe BWRs from the United States, which started up in 1969, now use locally-enriched uranium and are under safeguards,

Two small Canadian PHWRs (1972 & 1980), also under safeguards, and

Ten local PHWRs based on Canadian designs, two of 150 and eight 200 MWe.

Two new 540 MWe and two 700 MWe plants at tarapore (known as TAPP :Tarapore Atomic Power Project)

The two under construction and two of the planned ones are 450 MWe versions of these 200 MWe domestic products. Construction has been seriously delayed by financial and technical problems.

In 2001 a final agreement was signed with Russia for the country's first large nuclear power plant, comprising two VVER-1000 reactors, under a Russian-financed US$3 billion contract. The first unit is due to be commissioned in 2007. A further two Russian units are under consideration for the site.

Nuclear power supplied 3.1% of India's electricity in 2000 and this was expected to reach 10% by 2005. Its industry is largely without IAEA safeguards, though a few plants (see above) are under facility-specific safeguards. As a result India's nuclear power programme proceeds largely without fuel or technological assistance from other countries.

Its weapons material appears to come from a Canadian-designed 40MW "research" reactor which started up in 1960, well before the NPT, and a 100MW indigenous unit in operation since 1985. Both use local uranium, as India does not import any nuclear fuel. It is estimated that India may have built up enough weapons-grade plutonium for a hundred nuclear warheads.

It is widely believed that the nuclear programs of India and Pakistan used CANDU reactors to produce fissionable materials for their weapons; however, this is not accurate. Both Canada (by supplying the 40 MW research reactor) and the United States (by supplying 21 tons of heavy water) supplied India with the technology necessary to create a nuclear weapons program, dubbed CIRUS (Canada-India Reactor, United States). Canada sold India the reactor on the condition that the reactor and any by-products would be "employed for peaceful purposes only."

Similarly, the United States sold India heavy water for use in the reactor "only... in connection with research into and the use of atomic energy for peaceful purposes". India, in violation of these agreements, used the Canadian-supplied reactor and American-supplied heavy water to produce plutonium for their first nuclear explosion, Smiling Buddha. The Indian government controversially justified this, however, by claiming that Smiling Buddha was a "peaceful nuclear explosion."

The country has at least three other research reactors including the tiny one which is exploring the use of thorium as a nuclear fuel, by breeding fissile U-233. In addition, an advanced heavy-water thorium cycle is under development.

India exploded a nuclear device in 1974, the so-called Smiling Buddha test, which it has consistently claimed was for peaceful purposes. Others saw it as a response to China's nuclear weapons capability. It was then universally perceived, notwithstanding official denials, to possess, or to be able to quickly assemble, nuclear weapons. In 1997 it deployed its own medium-range missile and is now developing a long-range missile capable of reaching targets in China's industrial heartland.

In 1995 the United States quietly intervened to head off a proposed nuclear test. However, in 1998 there were five more tests in Operation Shakti. These were unambiguously military, including one claimed to be of a sophisticated thermonuclear device, and their declared purpose was "to help in the design of nuclear weapons of different yields and different delivery systems".

Indian security policies are driven by:

Its determination to be recognized as a dominant power in the region

Its increasing concern with China's expanding nuclear weapons and missile delivery programmes

Its concern with Pakistan's capability to deliver nuclear weapons deep into India

It perceives nuclear weapons as a cost-effective political counter to China's nuclear and conventional weaponry, and the effects of its nuclear weapons policy in provoking Pakistan is, by some accounts, considered incidental.

India has had an unhappy relationship with China. After an uneasy ceasefire ended the 1962 war, relations between the two nations were frozen until 1998. Since then a degree of high-level contact has been established and a few elementary confidence-building measures put in place. China still occupies some territory which it captured during the aforementioned war, claimed by India, and India still occupies some territory claimed by China. Its nuclear weapon and missile support for Pakistan is a major bone of contention.

American President George W. Bush met with India Prime Minister Manmohan Singh to discuss India's involvement with nuclear weapons. The two countries agreed that the United States would give nuclear power assistance to India.

Pakistan

Pakistan is believed to have produced the material for its weapons using Chinese help.

In Pakistan, nuclear power supplies only 1.7% of the country's electricity. It has one small (125 MWe) Canadian PHWR nuclear power reactor from 1971 which is under international safeguards, and a 300 MWe PWR supplied by China under safeguards, which started up in May 2000. A third one, a Chinese PWR, is planned. Enriched fuel for the PWRs will be imported from China.

It also has a 9 MW research reactor of 1965 vintage, and there are persistent reports of another "multipurpose" reactor, a 50 MW PHWR near Khushab, which is presumed to have potential for producing weapons plutonium.

Pakistan's concentration is on weapons technology, particularly the production of highly enriched uranium suitable for nuclear weapons, utilising indigenous uranium. It has at least one small centrifuge enrichment plant. In 1990 the U.S. Administration cut off aid because it was unable to certify that Pakistan was not pursuing a policy of manufacturing nuclear weapons.

This was relaxed late in 2001. In 1996 the United States froze export loans to China because it was allegedly supplying centrifuge enrichment technology to Pakistan. Indian opinion is in no doubt about Pakistan's nuclear weapons capability.

Pakistan has made it clear since early 1996 that it had done the basic development work, and that if India staged a nuclear test, Pakistan would immediately start assembling its own nuclear explosive device. It is assumed to now have enough highly-enriched uranium for up to forty nuclear warheads.

In April 1998 Pakistan test fired a long-range missile capable of reaching Chennai in southern India, pushing home the point by naming it after a 12th century Muslim conqueror. This development removed India's main military advantage over Pakistan. Pakistan's security concerns derive from India's possession of a nuclear weapons capability.

In May 1998 Pakistan announced that they had conducted six underground tests in the Chagai Hills, five on the 28th and one on the 30th of that month. Seismic events consistent with these claims were recorded.

Pakistan-North Korea Nuclear Proliferation and Missile Cooperation

Pakistan and North Korea's efforts to acquire nuclear weapons have had some similarities. Both countries first attempted the plutonium route to acquire such weapons and, when this was thwarted, turned towards uranium enrichment.

Pakistan

In the 1970s, Pakistan first focused on the plutonium route. They expected to obtain the fissile material from a reprocessing plant provided by France. This plan failed due to U.S. intervention. Pakistan, not wanting to give up, redoubled its efforts to obtain uranium enrichment technology. The main ef-

forts towards this direction were done under Dr. Abdul Qadeer Khan.

Dr. Khan had earlier worked with Fysisch Dynamisch Onderzoekslaboratorium (FDO). FDO was a subsidiary of the Dutch firm VMF-Stork based in Amsterdam. From 1972 to 1975 Dr. Khan had access to classified data used to enrich ordinary uranium to weapons grade concentrations. FDO was working on the development of ultra high-speed centrifuges for URENCO.

In 1974 while he was on secondment for 17 days as a translator to the URENCO plant in Almelo, he obtained photographs and documents of the plant. Dr. Khan returned to Pakistan in 1976 and initiated the Uranium enrichment program on the basis of the technology he had stolen from his previous employer. Dr. Khan relied on nuclear technology supplied by American, Canadian, Swiss, German, Dutch, British, Japanese and Russian companies.

Dr. Khan said of the assistance he got from the Japanese, "Next month the Japanese would come here and all the work would be done under their supervision." After the British Government stopped the British subsidiary of the American Emerson Electric Co from shipping the nuclear technology to Pakistan, Dr. Khan describes his frustration with a supplier from Germany as "That man from the German team was unethical. When he did not get the order from us, he wrote a letter to a Labour Party member and questions were asked in [British] Parliament."

His efforts made Dr. Khan into a national hero. In 1981, as a tribute, the president of Pakistan, General Muhammad Zia-ul-Haq, renamed the enrichment plant the A. Q. Khan Research Laboratories.

In 2003, IAEA unearthed a nuclear black market with close ties to Pakistan. It was widely believed to have direct involvement of the government of Pakistan. This claim could not be verified due to the refusal of the government of Pakistan to allow IAEA to interview the alleged head of the nuclear black market, who happened to be no other than Dr. Khan.

Dr. Khan later confessed to his crimes on national television, bailing out the government by taking full responsibility. He confessed to nuclear proliferation from Pakistan to Iran and North Korea. He was immediately given presidential immunity. Exact nature of the involvement at the governmental level is still unclear, but the manner in which the government acted cast doubt on the sincerity of Pakistan.

North Korea

North Korea joined the NPT in 1985 and had subsequently signed a safeguards agreement with the IAEA. However it was believed that North Korea was diverting plutonium extracted from the fuel of its reactor at Yongbyon, for use in nuclear weapons. The subsequent confrontation with IAEA on the issue of inspections and suspected violations, resulted in North Korea threatening to withdraw from the NPT in 1993.

This led to negotiations with the United States resulting in the Agreed Framework of 1994, which provided for IAEA safeguards being applied to its reactors and spent fuel rods. These spent fuel rods were sealed in canisters by the United States to prevent North Korea from extracting plutonium from them. North Korea had to therefore freeze its plutonium programme.

During this period Pakistan-North Korea cooperation in missile technology transfer was being established. A high level Pakistani military delegation visited North Korea in August-September 1992, reportedly to discuss the supply of Scud missile technology to Pakistan. In 1993, PM Benazir Bhutto traveled to China and North Korea. The visits are believed to be related to the subsequent acquisition of Ghauri (North Korean No-dong) missiles by Pakistan.

During the period 1992-1994, A.Q. Khan was reported to have visited North Korea thirteen times. The missile cooperation program with North Korea was under Dr. A. Q. Khan's Kahuta Research Laboratories. At this time China was under U.S.

pressure not to supply the M series of missiles to Pakistan. This forced the latter (possibly with Chinese connivance) to approach North Korea for missile transfers. Reports indicate that North Korea was willing to supply missile sub-systems including rocket motors, inertial guidance systems, control and testing equipment of Scud SSMs for US$ 50 million.

It is not clear what North Korea got in return. Joseph S. Bermudez Jr. in Jane's Defence Weekly (27 November 2002) reports that Western analysts had begun to question what North Korea received in payment for the missiles; many suspected it was nuclear technology and components. Khan's KRL was in charge of both Pakistan's uranium enrichment program and also of the missile program with North Korea.

It is therefore likely during this period that cooperation in nuclear technology between Pakistan and North Korea was initiated. Western intelligence agencies began to notice exchange of personnel, technology and components between KRL and entities of the North Korean 2nd Economic Committee (responsible for weapons production).

A New York Times report on 18 October 2002 quoted U.S. intelligence officials having stated that Pakistan was a major supplier of critical equipment to North Korea. The report added that equipment such as gas centrifuges appeared to have been "part of a barter deal" in which North Korea supplied Pakistan with missiles.

Separate reports indicate (Washington Times, 22 November 2002) that U.S. intelligence had as early as 1999 picked up signs that North Korea was continuing to develop nuclear arms. Other reports also indicate that North Korea had been working covertly to develop an enrichment capability for nuclear weapons for at least five years and had used technology obtained from Pakistan (Washington Times, 18 October 2002).

Nuclear arms control in the region

The public stance of the two states on non-proliferation differs markedly. Pakistan appears to have dominated a continuing propaganda debate.

Pakistan has initiated a series of regional security proposals. It has repeatedly proposed a nuclear free zone in South Asia and has proclaimed its willingness to engage in nuclear disarmament and to sign the Non-Proliferation Treaty if India would do so. It has endorsed a United States proposal for a regional five power conference to consider non-proliferation in South Asia.

India has taken the view that solutions to regional security issues should be found at the international rather than the regional level, since its chief concern is with China. It therefore rejects Pakistan's proposals.

Instead, the 'Gandhi Plan', put forward in 1988, proposed the revision of the Non-Proliferation Treaty, which it regards as inherently discriminatory in favor of the nuclear-weapon States, and a timetable for complete nuclear weapons disarmament. It endorsed early proposals for a Comprehensive Test Ban Treaty and for an international convention to ban the production of highly enriched uranium and plutonium for weapons purposes, known as the 'cut-off' convention.

The United States for some years, especially under the Clinton administration, pursued a variety of initiatives to persuade India and Pakistan to abandon their nuclear weapons programs and to accept comprehensive international safeguards on all their nuclear activities. To this end, the Clinton administration proposed a conference of the five nuclear-weapon states, Japan, Germany, India and Pakistan.

India refused this and similar previous proposals, and countered with demands that other potential weapons states, such as Iran and North Korea, should be invited, and that regional limitations would only

be acceptable if they were accepted equally by China. The United States would not accept the participation of Iran and North Korea and these initiatives have lapsed.

Another, more recent approach, centers on 'capping' the production of fissile material for weapons purposes, which would hopefully be followed by 'roll back'. To this end, India and the United States jointly sponsored a UN General Assembly resolution in 1993 calling for negotiations for a 'cut-off' convention.

Should India and Pakistan join such a convention, they would have to agree to halt the production of fissile materials for weapons and to accept international verification on their relevant nuclear facilities (enrichment and reprocessing plants). It appears that India is now prepared to join negotiations regarding such a Cut-off Treaty, under the UN Conference on Disarmament.

Bilateral confidence-building measures between India and Pakistan to reduce the prospects of confrontation have been limited. In 1990 each side ratified a treaty not to attack the other's nuclear installations, and at the end of 1991 they provided one another with a list showing the location of all their nuclear plants, even though the respective lists were regarded as not being wholly accurate.

Early in 1994 India proposed a bilateral agreement for a 'no first use' of nuclear weapons and an extension of the 'no attack' treaty to cover civilian and industrial targets as well as nuclear installations.

Having promoted the Comprehensive Test Ban Treaty since 1954, India dropped its support in 1995 and in 1996 attempted to block the Treaty.

Following the 1998 tests the question has been reopened and both Pakistan and India have indicated their intention to sign the CTBT. Indian ratification may be conditional upon the five weapons states agreeing to specific reductions in nuclear arsenals. The UN Conference on Disarmament has also called upon both countries "to accede without delay to the Non-Proliferation Treaty", presumably as non-weapons states.

Israel

Israel is also thought to possess an arsenal of potentially up to several hundred nuclear warheads and associated delivery systems, but this has never been openly confirmed or denied.

An Israeli nuclear installation is located about ten kilometers to the south of Dimona, the Negev Nuclear Research Center. Its construction commenced in 1958, with French assistance.

The official reason given by the Israeli and French governments was to build a nuclear reactor to power a "desalination plant", in order to "green the Negev". The purpose of the Dimona plant is widely assumed to be the manufacturing of nuclear weapons, and the majority of defense experts have concluded that it does in fact do that. However, the Israeli government refuses to confirm or deny this publicly, a policy it refers to as "ambiguity".

Norway sold 20 tonnes of heavy water needed for the reactor to Israel in 1959 and 1960 in a secret deal. There were no "safeguards" required in this deal to prevent usage of the heavy water for non-peaceful purposes. The British newspaper Daily Express accused Israel of working on a bomb in 1960.

When the United States intelligence community discovered the purpose of the Dimona plant in the early 1960s, it demanded that Israel agree to international inspections. Israel agreed, but on a condition that U.S., rather than IAEA, inspectors were used, and that Israel would receive advanced notice of all inspections.

Some claim that because Israel knew the schedule of the inspectors' visits, it was able to hide the alleged purpose of the site from the inspectors by installing temporary false walls and other devices before each inspection. The inspectors eventually informed the U.S. government that their inspections were useless due to Israeli restrictions on what ar-

eas of the facility they could inspect. In 1969, the United States terminated the inspections.

In 1986, Mordechai Vanunu, a former technician at the Dimona plant, revealed to the media some evidence of Israel's nuclear program. Israeli agents arrested him from Italy, drugged him and transported him to Israel, and an Israeli court then tried him in secret on charges of treason and espionage, and sentenced him to eighteen years imprisonment. He was freed on 21 April 2004, but was severely limited by the Israeli government. He was arrested again on 11 November 2004, though formal charges were not immediately filed.

Comments on photographs taken by Mordechai Vanunu inside the Negev Nuclear Research Center have been made by prominent scientists. British nuclear weapons scientist Frank Barnaby, who questioned Vanunu over several days, estimated Israel had enough plutonium for about 150 weapons. Ted Taylor, a bomb designer employed by the United States of America has confirmed the several hundred warhead estimate based on Vanunu's photographs.

Signatory states

(Egypt)

In 2004 and 2005, Egypt disclosed past undeclared nuclear activities and material to the IAEA. In 2007 and 2008, high enriched and low enriched uranium particles were found in environmental samples taken in Egypt. In 2008, the IAEA states Egypt's statements were consistent with its own findings.[16] In May 2009, Reuters reported that the IAEA was conducting further investigation in Egypt.

(Iran)

In 2003, the IAEA reported that Iran had been in breach of its obligations to comply with provisions of its safeguard agreement. In 2005, the IAEA Board of Governors voted in a rare non-consensus decision to find Iran in non-compliance with its NPT Safeguards Agreement and to report that non-compliance to the UN Security Council, In response, the UN Security Council passed a series of resolutions in response to concerns about the program.

Iran's representative to the UN argues sanctions compel Iran to abandon its rights under the Nuclear Nonproliferation Treaty to peaceful nuclear technology. Iran says its uranium enrichment program is exclusively for peaceful purposes and has enriched uranium to "less than 5 percent," consistent with fuel for a nuclear power plant and significantly below the purity of WEU (around 90%) typically used in a weapons program.

The director general of the International Atomic Energy Agency, Yukiya Amano, said in 2009 he had not seen any evidence in IAEA official documents that Iran was developing nuclear weapons.

(Iraq)

Up to the late 1980s it was generally assumed that any undeclared nuclear activities would have to be based on the diversion of nuclear material from safeguards. States acknowledged the possibility of nuclear activities entirely separate from those covered by safeguards, but it was assumed they would be detected by national intelligence activities. There was no particular effort by IAEA to attempt to detect them.

Iraq had been making efforts to secure a nuclear potential since the 1960s. In the late 1970s a specialised plant, Osiraq, was constructed near Baghdad. The plant was attacked during the Iran–Iraq War and was destroyed by Israeli bombers in June 1981.

Not until the 1990 NPT Review Conference did some states raise the possibility of making more use of (for example) provisions for "special inspections" in existing NPT Safeguards Agreements. Special inspections can be undertaken at locations other than those where safeguards routinely apply, if there is reason to believe there may be undeclared material or activities.

After inspections in Iraq following the UN Gulf War cease-fire resolution showed the extent of Iraq's clandestine nuclear weapons program, it became clear that the IAEA would have to broaden the scope of its activities. Iraq was an NPT Party, and had thus agreed to place all its nuclear material under IAEA safeguards. But the inspections revealed that it had been pursuing an extensive clandestine uranium enrichment programme, as well as a nuclear weapons design programme.

The main thrust of Iraq's uranium enrichment program was the development of technology for electromagnetic isotope separation (EMIS) of indigenous uranium.

This uses the same principles as a mass spectrometer (albeit on a much larger scale). Ions of uranium-238 and uranium-235 are separated because they describe arcs of different radii when they move through a magnetic field. This process was used in the Manhattan Project to make the highly enriched uranium used in the Hiroshima bomb, but was abandoned soon afterwards.

The Iraqis did the basic research work at their nuclear research establishment at Tuwaitha, near Baghdad, and were building two full-scale facilities at Tarmiya and Ash Sharqat, north of Baghdad. However, when the war broke out, only a few separators had been installed at Tarmiya, and none at Ash Sharqat.

The Iraqis were also very interested in centrifuge enrichment, and had been able to acquire some components including some carbon-fibre rotors, which they were at an early stage of testing.

They were clearly in violation of their NPT and safeguards obligations, and the IAEA Board of Governors ruled to that effect. The UN Security Council then ordered the IAEA to remove, destroy or render harmless Iraq's nuclear weapons capability. This was done by mid 1998, but Iraq then ceased all cooperation with the UN, so the IAEA withdrew from this work.

The revelations from Iraq provided the impetus for a very far-reaching reconsideration of what safeguards are intended to achieve.

(Myanmar)

A report in the Sydney Morning Herald and Searchina, a Japanese newspaper, report that two Myanmarese defectors saying that the Myanmar junta was secretly building a nuclear reactor and plutonium extraction facility with North Korea's help, with the aim of acquiring its first nuclear bomb in five years. According to the report, "The secret complex, much of it in caves tunnelled into a mountain at Naung Laing in northern Burma, runs parallel to a civilian reactor being built at another site by Russia that both the Russians and Burmese say will be put under international safeguards."

In 2002, Myanmar had notified IAEA of its intention to pursue a civilian nuclear programme. Later, Russia announced that it would build a nuclear reactor in Myanmar. There have also been reports that two Pakistani scientists, from the AQ Khan stable, had been dispatched to Myanmar where they had settled down, to help Myanmar's project.

Recently, the David Albright-led Institute for Science and International Security rang alarm bells about Myanmar attempting a nuclear project with North Korean help.

If true, the full weight of international pressure will be brought against Myanmar, said officials familiar with developments. But equally, the information that has been peddled by the defectors is also "preliminary" and could be used by the west to turn the screws on Myanmar—on democracy and human rights issues—in the run-up to the elections in the country in 2010.

During an ASEAN meeting in Thailand in July 2009, US secretary of state Hillary Clinton highlighted concerns of the North Korean link. "We know there are also growing concerns about military cooperation between North Korea and Burma which we take very seriously," Clinton said.

(North Korea)

The Democratic People's Republic of Korea (DPRK) acceded to the NPT in 1985 as a condition for the supply of a nuclear power station by the USSR. However, it delayed concluding its NPT Safeguards Agreement with the IAEA, a process which should take only 18 months, until April 1992.

During that period, it brought into operation a small gas-cooled, graphite-moderated, natural-uranium (metal) fuelled "Experimental Power Reactor" of about 25 MWt (5 MWe), based on the UK Magnox design. While this was a well-suited design to start a wholly indigenous nuclear reactor development, it also exhibited all the features of a small plutonium production reactor for weapons purposes.

North Korea also made substantial progress in the construction of two larger reactors designed on the same principles, a prototype of about 200 MWt (50 MWe), and a full-scale version of about 800 MWt (200 MWe). They made only slow progress; construction halted on both in 1994 and has not resumed. Both reactors have degraded considerably since that time and would take significant efforts to refurbish.

In addition it completed and commissioned a reprocessing plant that makes the Magnox spent nuclear fuel safe, recovering uranium and plutonium. That plutonium, if the fuel was only irradiated to a very low burn-up, would have been in a form very suitable for weapons. Although all these facilities at Yongbyon were to be under safeguards, there was always the risk that at some stage, the DPRK would withdraw from the NPT and use the plutonium for weapons.

One of the first steps in applying NPT safeguards is for the IAEA to verify the initial stocks of uranium and plutonium to ensure that all the nuclear materials in the country have been declared for safeguards purposes.

While undertaking this work in 1992, IAEA inspectors found discrepancies which indicated that the reprocessing plant had been used more often than the DPRK had declared, which suggested that the DPRK could have weapons-grade plutonium which it had not declared to the IAEA. Information passed to the IAEA by a Member State (as required by the IAEA) supported that suggestion by indicating that the DPRK had two undeclared waste or other storage sites.

In February 1993 the IAEA called on the DPRK to allow special inspections of the two sites so that the initial stocks of nuclear material could be verified. The DPRK refused, and on 12 March announced its intention to withdraw from the NPT (three months' notice is required).

In April 1993 the IAEA Board concluded that the DPRK was in non-compliance with its safeguards obligations and reported the matter to the UN Security Council. In June 1993 the DPRK announced that it had "suspended" its withdrawal from the NPT, but subsequently claimed a "special status" with respect to its safeguards obligations. This was rejected by IAEA.

Once the DPRK's non-compliance had been reported to the UN Security Council, the essential part of the IAEA's mission had been completed. Inspections in the DPRK continued, although inspectors were increasingly hampered in what they were permitted to do by the DPRK's claim of a "special status". However, some 8,000 corroding fuel rods associated with the experimental reactor have remained under close surveillance.

Following bilateral negotiations between the United States and the DPRK, and the conclusion of the Agreed Framework in October 1994, the IAEA has been given additional responsibilities. The agreement requires a freeze on the operation and construction of the DPRK's plutonium production reactors and their related facilities, and the IAEA is responsible for monitoring the freeze until the facilities are eventually dismantled. The DPRK remains uncooperative with the IAEA verification work and has yet to comply with its safeguards agreement.

While Iraq was defeated in a war, allowing the UN the opportunity to seek out and destroy its nuclear weapons programme as part of the cease-fire conditions, the DPRK was not defeated, nor was it vulnerable to other measures, such as trade sanctions. It can scarcely afford to import anything, and sanctions on vital commodities, such as oil, would either be ineffective or risk provoking war.

Ultimately, the DPRK was persuaded to stop what appeared to be its nuclear weapons programme in exchange, under the agreed framework, for about US$5 billion in energy-related assistance. This included two 1000 MWe light water nuclear power reactors based on an advanced U.S. System-80 design.

In January 2003 the DPRK withdrew from the NPT. In response, a series of discussions among the DPRK, the United States, and China, a series of six-party talks (the parties being the DPRK, the ROK, China, Japan, the United States and Russia) were held in Beijing; the first beginning in April 2004 concerning North Korea's weapons program.

On 10 January 2005, North Korea declared that it was in the possession of nuclear weapons. On 19 September 2005, the fourth round of the Six-Party Talks ended with a joint statement in which North Korea agreed to end its nuclear programs and return to the NPT in exchange for diplomatic, energy and economic assistance.

However, by the end of 2005 the DPRK had halted all six-party talks because the United States froze certain DPRK international financial assets such as those in a bank in Macau. On 9 October 2006, North Korea announced that it has performed its first-ever nuclear weapon test. On 18 December 2006, the six-party talks finally resumed.

On 13 February 2007, the parties announced "Initial Actions" to implement the 2005 joint statement including shutdown and disablement of North Korean nuclear facilities in exchange for energy assistance. Reacting to UN sanctions imposed after missile tests in April 2009, North Korea withdrew from the six-party talks, restarted its nuclear facilities and conducted a second nuclear test on 25 May 2009.

(Russia)

Security of nuclear weapons in Russia remains a matter of concern. According to high-ranking Russian SVR defector Tretyakov, he had a meeting with two Russian businessman representing a state-created Chetek corporation in 1991.

They came up with a project of destroying large quantities of chemical wastes collected from Western countries at the island of Novaya Zemlya (a test place for Soviet nuclear weapons) using an underground nuclear blast. The project was rejected by Canadian representatives, but one of the businessmen told Tretyakov that he keeps his own nuclear bomb at his dacha outside Moscow.

Tretyakov thought that man was insane, but the "businessmen" (Vladimir K. Dmitriev) replied: "Do not be so naive. With economic conditions the way they are in Russia today, anyone with enough money can buy a nuclear bomb. It's no big deal really".

(South Africa)

In 1991, South Africa acceded to the NPT, concluded a comprehensive safeguards agreement with the IAEA, and submitted a report on its nuclear material subject to safeguards. At the time, the state had a nuclear power programme producing nearly 10% of the country's electricity, whereas Iraq and North Korea only had research reactors.

The IAEA's initial verification task was complicated by South Africa's announcement that between 1979 and 1989 it built and then dismantled a number of nuclear weapons. South Africa asked the IAEA to verify the conclusion of its weapons programme. In 1995 the IAEA declared that it was satisfied all materials were accounted for and the weapons programme had been terminated and dismantled.

South Africa has signed the NPT, and now holds the distinction of being the only known state to have

indigenously produced nuclear weapons, and then verifiably dismantled them.

(Syria)

On September 6, 2007, Israel bombed an officially unidentified site in Syria which it later asserted was a nuclear reactor under construction (see Operation Orchard). The alleged reactor was not asserted to be operational and it was not asserted that nuclear material had been introduced into it. Syria said the site was a military site and was not involved in any nuclear activities.

The IAEA requested Syria to provide further access to the site and any other locations where the debris and equipment from the building had been stored. Syria denounced what it called the Western "fabrication and forging of facts" in regards to the incident.

IAEA Director General Mohamed ElBaradei criticized the strikes and deplored that information regarding the matter had not been shared with his agency earlier.

United States cooperation on nuclear weapons with the United Kingdom

The United States has given the UK considerable assistance with nuclear weapon design and construction since the 1958 US-UK Mutual Defence Agreement. In 1974 a CIA proliferation assessment noted that "In many cases [Britain's sensitive technology in nuclear and missile fields] is based on technology received from the United States and could not legitimately be passed on without U.S. permission."

The U.S. President authorized the transfer of "nuclear weapon parts" to the UK between at least the years 1975 to 1996. The UK National Audit Office noted that most of the UK Trident warhead development and production expenditure was incurred in the United States, which would supply "certain warhead-related components". Some of the fissile materials for the UK Trident warhead were purchased from the United States.

Declassified U.S. Department of Energy documents indicate the UK Trident warhead system was involved in non-nuclear design activities alongside the U.S. W76 nuclear warhead fitted in some U.S. Navy Trident missiles, leading the Federation of American Scientists to speculate that the UK warhead may share design information from the W76.

Under the Mutual Defence Agreement 5.37 tonnes of UK-produced plutonium was sent to the United States in return for 6.7 kg of tritium and 7.5 tonnes of highly enriched uranium over the period 1960-1979. A further 0.47 tonne of plutonium was swapped between the UK and United States for reasons that remain classified. Some of the UK produced plutonium was used in 1962 by the United States for a nuclear weapon test of reactor-grade plutonium .

The United States has supplied nuclear weapon delivery systems to support the UK nuclear forces since before the signing of the NPT. The renewal of this agreement is due to take place through the second decade of the 21st century.

Arguments in favour of proliferation

There has been much debate in the academic study of International Security as to the advisability of proliferation. In the late 1950s and early 1960s, Gen. Pierre Marie Gallois of France, an adviser to Charles DeGaulle, argued in books like The Balance of Terror:

Strategy for the Nuclear Age (1961) that mere possession of a nuclear arsenal, what the French called the force de frappe, was enough to ensure deterrence, and thus concluded that the spread of nuclear weapons could increase international stability.

Some very prominent neo-realist scholars, such as Kenneth Waltz, Emeritus Professor of Political Science at UC Berkeley and Adjunct Senior Research

Scholar at Columbia University, and John Mearsheimer, R. Wendell Harrison Distinguished Service Professor of Political Science at the University of Chicago, continue to argue along the lines of Gallois (though these scholars rarely acknowledge their intellectual debt to Gallois and his contemporaries).

Specifically, these scholars advocate some forms of nuclear proliferation, arguing that it will decrease the likelihood of war, especially in troubled regions of the world. Aside from the majority opinion which opposes proliferation in any form, there are two schools of thought on the matter: those, like Mearsheimer, who favor selective proliferation, and those such as Waltz, who advocate a laissez-faire attitude to programs like North Korea's.

Total proliferation

In embryo, Waltz argues that the logic of mutually assured destruction (MAD) should work in all security environments, regardless of historical tensions or recent hostility. He sees the Cold War as the ultimate proof of MAD logic – the only occasion when enmity between two Great Powers did not result in military conflict.

This was, he argues, because nuclear weapons promote caution in decision-makers. Neither Washington nor Moscow would risk nuclear Armageddon to advance territorial or power goals, hence a peaceful stalemate ensued. Waltz believes there to be no reason why this effect would not occur in all circumstances.

Selective proliferation

John Mearsheimer would not support Waltz's optimism in the majority of potential instances; however, he has argued for nuclear proliferation as policy in certain places, such as post-Cold War Europe. In two famous articles, Professor Mearsheimer opines that Europe is bound to return to its pre-Cold War environment of regular conflagration and suspicion at some point in the future. He advocates arming both Germany and the Ukraine with nuclear weaponry in order to achieve a balance of power between these states in the east and France/Britain in the west. If this does not occur, he is certain that war will eventually break out on the European continent.

Another separate argument against Waltz's open proliferation and in favor of Mearsheimer's selective distribution is the possibility of nuclear terrorism. Some countries included in the aforementioned laissez-faire distribution could predispose the transfer of nuclear materials or a bomb falling into the hands of groups not affiliated with any governments.

Such countries would not have the political will or ability to safeguard attempts at devices being transferred to a third party. Not being deterred by self-annihilation, terrorism groups could push forth their own nuclear agendas or be used as shadow fronts to carry out the attack plans by mentioned unstable governments.

Arguments against Both Positions

There are numerous arguments presented against both selective and total proliferation, generally targeting the very neorealist assumptions (such as the primacy of military security in state agendas, the weakness of international institutions, and the long-run unimportance of economic integration and globalization to state strategy) its proponents tend to make.

With respect to Mearsheimer's specific example of Europe, many economists and neoliberals argue that the economic integration of Europe through the development of the European Union has made war in most of the European continent so disastrous economically so as to serve as an effective deterrent.

Constructivists take this one step further, frequently arguing that the development of EU political institutions has led or will lead to the development of a nascent European identity, which most states on the European continent wish to partake in to some de-

gree or another, and which makes all states within or aspiring to be within the EU regard war between them as unthinkable.

As for Waltz, the general opinion is that most states are not in a position to safely guard against nuclear use, that he under-estimates the long-standing antipathy in many regions, and that weak states will be unable to prevent - or will actively provide for - the disastrous possibility of nuclear terrorism. Waltz has dealt with all of these objections at some point in his work; though to many, he has not adequately responded.

The Learning Channel documentary Doomsday: "On The Brink" illustrated 40 years of U.S. and Soviet nuclear weapons accidents. Even the 1995 Norwegian rocket incident demonstrated a potential scenario in which Russian democratization and military downsizing at the end of the Cold War did not eliminate the danger of accidental nuclear war through command and control errors.

After asking: might a future Russian ruler or renegade Russian general be tempted to use nuclear weapons to make foreign policy? the documentary writers revealed a greater danger of Russian security over its nuclear stocks, but especially the ultimate danger of human nature to want the ultimate weapon of mass destruction to exercise political and military power.

Future world leaders might not understand how close the Soviets, Russians, and Americans were to doomsday, how easy it all seemed because apocalypse was avoided for a mere 40 years between rivals, politicians not terrorists, who loved their children and did not want to die, against 30,000 years of human prehistory. History and military experts agree that proliferation can be slowed, but never stopped (technology cannot be uninvented).

Proliferation begets proliferation

Proliferation begets proliferation is a concept described by Scott Sagan in his article, Why Do States Build Nuclear Weapons? This concept can be described as a strategic chain reaction. If one state produces a nuclear weapon it creates almost a domino effect within the region. States in the region will seek to acquire nuclear weapons to balance or eliminate the security threat.

Sagan describes this reaction best in his article when he states, “Every time one state develops nuclear weapons to balance against its main rival, it also creates a nuclear threat to another region, which then has to initiate its own nuclear weapons program to maintain its national security”.

Going back through history we can see how this has taken place. When the United States demonstrated that it had nuclear power capabilities after the bombing of Hiroshima and Nagasaki, the Russians started to develop their program in preparation for the Cold War. With the Russian military buildup, France and Great Britain perceived this as a security threat and therefore they pursued nuclear weapons.

Chemical Weapons Convention

The Chemical Weapons Convention (CWC) is an arms control agreement which outlaws the production, stockpiling and use of chemical weapons. Its full name is the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction.

The current agreement is administered by the Organisation for the Prohibition of Chemical Weapons (OPCW), which is an independent organization and often mistaken as being a department within the United Nations.

As of May 2009, 188 states are party to the CWC, and another two countries have signed but not yet ratified the convention.

Administration

Intergovernmental consideration of a chemical and biological weapons ban was initiated in 1968 within the 18-nation Disarmament Committee, which, after numerous changes of name and composition, became the Conference on Disarmament (CD) in 1984.

On September 3, 1992 the Conference on Disarmament submitted to the U.N. General Assembly its annual report, which contained the text of the Chemical Weapons Convention, the full title of which is "Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction." The General Assembly approved the Convention on November 30, 1992, and The U.N. Secretary-General then opened the Convention for signature in Paris on January 13, 1993.

The CWC remained open for signature until its entry into force on April 29, 1997, 180 days after the deposit of the 65th instrument of ratification (by Hungary). The convention augments the Geneva Protocol of 1925 for chemical weapons and includes extensive verification measures such as on-site inspections. It does not, however, cover biological weapons. The convention is administered by the Organization for the Prohibition of Chemical Weapons (OPCW), which conducts inspection of military and industrial plants in all of the member nations as well as working with stockpile countries.

Controlled substances

The convention distinguishes three classes of controlled substance, chemicals which can either be used as weapons themselves or used in the manufacture of weapons. The classification is based on the quantities of the substance produced commercially for legitimate purposes. Each class is split into Part A, which are chemicals that can be used directly as weapons, and Part B which are chemicals useful in the manufacture of chemical weapons.

Schedule 1 chemicals have few, or no uses outside of chemical weapons. These may be produced or used for research, medical, pharmaceutical or chemical weapon defence testing purposes but production above 100 grams per year must be declared to the OPCW.

A country is limited to possessing a maximum of 1 tonne of these materials. Examples are mustard and nerve agents, and substances which are solely used as precursor chemicals in their manufacture. A few of these chemicals have very small scale non-military applications, for example minute quantities of nitrogen mustard are used to treat certain cancers.

Schedule 2 chemicals have legitimate small-scale applications. Manufacture must be declared and there are restrictions on export to countries which are not CWC signatories. An example is thiodiglycol which can be used in the manufacture of mustard agents, but is also used as a solvent in inks.

Schedule 3 chemicals have large-scale uses apart from chemical weapons. Plants which manufacture more than 30 tonnes per year must be declared and can be inspected, and there are restrictions on export to countries which are not CWC signatories. Examples of these substances are phosgene, which has been used as a chemical weapon but which is also a precursor in the manufacture of many legitimate organic compounds and triethanolamine, used in the manufacture of nitrogen mustard but also commonly used in toiletries and detergents.

The treaty also deals with carbon compounds called in the treaty Discrete organic chemicals. These are any carbon compounds apart from long chain polymers, oxides, sulfides and metal carbonates, such as organophosphates. The OPCW must be informed of, and can inspect, any plant producing (or expecting to produce) more than 200 tonnes per year, or 30 tonnes if the chemical contains phosphorus, sulfur or fluorine, unless the plant solely produces explosives or hydrocarbons.

Timeline

The treaty set up several steps with deadlines toward complete destruction of chemical weapons, with a procedure for requesting deadline extensions. No country reached total elimination by the original treaty date although several have finished under allowed extensions.

Member states

Almost all countries in the world have joined the Chemical Weapons Convention. Currently 188 of the 195 states recognized by the United Nations are party to the CWC. Of the seven states that are not, two have signed but not yet ratified the treaty (Burma and Israel) and five states have not signed the treaty (Angola, North Korea, Egypt, Somalia, and Syria).

Members states with declared stockpiles of chemical weapons

As of May 2009, there were four member countries which had declared stockpiles:

- Iraq
- Libya
- Russia
- United States

Iraq did not enter the treaty until February 2009, not declaring a weapons stockpile until April, apparently indicating the continuing presence of some chemical warfare remnants.

World stockpile

The total world declared stockpile of chemical weapons was about 30,308 tons in early 2010. A total of 71,315 tonnes of agents, 8.67 million munitions and containers, and 70 production facilities were declared to OPCW before destruction activities began. Several countries that are not members are suspected of having chemical weapons, especially Syria and North Korea, while some member states (including Sudan and the People's Republic of China) have been accused by others of failing to disclose their stockpiles.

Current progress

By February 28, 2010, a total of 40,886 metric tons or 57.4% of all declared chemical weapons had been destroyed including all Class 3 declared chemicals. More than 45% (3.93 million) chemical munitions and containers have been destroyed. (Treaty confirmed destruction totals often lag behind state-declared totals.) Only about 50% of countries had passed the required legislation to outlaw participation in chemical weapons production.

Albania: On July 11, 2007, the OPCW confirmed the destruction of the entire chemical weapons stockpile in Albania. Albania is the first nation to completely destroy all of its chemical weapons under the terms of the CWC. The Albanian stockpile included 16,678 kilograms of mustard agent, lewisite, adamsite, and chloroacetophenone. The United States assisted with and funded the destruction operations.

A State Party: The unspecified "state party" had destroyed all of its stockpile by the end of 2008.

India: 100% of India's chemical weapons stockpile was destroyed by the end of April 2009.

Iraq: Iraq joined in CWC in 2009, declaring "two bunkers with filled and unfilled chemical weapons munitions, some precursors, as well as five former chemical weapons production facilities" according to OPCW Director General Rogelio Pfirter.

No plans were announced at that time for the destruction of the material, although it was noted that the bunkers were damaged in the 2003 war and even inspection of the site must be carefully planned. Most of Iraq's chemical weapons were previously destroyed under a United Nations reduction program after the 1991 Gulf War.

Approximately five hundred degraded chemical munitions have been found in Iraq since the 2003 invasion of Iraq, according to a report of the US

National Ground Intelligence Center. These weapons contained sarin and mustard agents but were so badly corroded that they could not have been used as originally intended.

Libya: Libya's entire chemical weapons stockpile is expected to be destroyed by 2011.

U.S.A.: The United States of America destroyed over 70% of its stockpiled agents (22,322 tons of the original 31,500 tons) as of 26 January, 2010 and over 2.3 million munitions. The U.S. had completed Phase III in June 2007, having destroyed over half of its stockpile.

By 2007, over 66% of the chemical weapons destroyed in the world since the treaty came into force were destroyed in the U.S. The United States General Accounting Office has announced it does not expect the United States to complete its campaign until 2014, after the treaty's final deadline. The Pentagon, in late 2006, announced that it expected disposal of the U.S. stockpile to not be completed until 2023.

Russia: Russia had destroyed around 18,000 metric tons, or 45%, of its chemical weapons stockpiles by the end of December 2009, passing phase III requirements. Russia had destroyed 24% by the end of 2007. Russia completed Phase II in 2007 and had received extensions on the remaining phases.

The United States General Accounting Office has announced it does not expect Russia to reach 100% destruction until 2027; however, Russia has declared its intention to complete operations by the treaty deadline of 2012.

Stockpiles eliminated under the Convention

Albania's stockpile was eliminated in 2007. An undeclared "state party", (probably South Korea) eliminated its stockpile in late 2008. India's stockpile was completely eliminated in April 2009.

Known production facilities (of chemical weapons)

Thirteen countries declared chemical weapons production facilities:

- Bosnia and Herzegovina
- China
- France
- India
- Iran
- Iraq
- Japan
- Libya
- Russian Federation
- Serbia
- United Kingdom
- United States

1 non-disclosed state party (referred to as "A State Party" in OPCW-communications)

By 2007, all 65 declared facilities had been deactivated and 94% (61) have been certified as destroyed or converted to civilian use. As of the end of February 2008, 42 facilities were destroyed while 19 were converted for civilian purposes.

In 2009, Iraq declared five production sites which were put out of commission by damage in the 1991 and 2003 wars; OPCW inspections were still required.

Financing

Financial support for the Albanian and Libyan stockpile destruction programmes was provided by the United States. Russia received support from a number of nations, including the United States, the United Kingdom, Germany, the Netherlands, Italy and Canada; some $2 billion given by 2004. Costs

for Albania's program were approximately 48 million U.S. dollars. The U.S. had spent $20 billion and expected to spend a further $40 billion.

Biological Weapons Convention

The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (usually referred to as the Biological Weapons Convention, abbreviation: BWC, or Biological and Toxin Weapons Convention, abbreviation: BTWC) was the first multilateral disarmament treaty banning the production of an entire category of weapons .

It was the result of prolonged efforts by the international community to establish a new instrument that would supplement the 1925 Geneva Protocol.

The BWC was opened for signature on April 10, 1972 and entered into force March 26, 1975 when twenty-two governments had deposited their instruments of ratification. It currently commits the 162 states that are party to it to prohibit the development, production, and stockpiling of biological and toxin weapons.

However, the absence of any formal verification regime to monitor compliance has limited the effectiveness of the Convention. (As of July 2008, an additional 13 states have signed the BWC but have yet to ratify it)

The scope of the BWC's prohibition is defined in Article 1 (the so-called general purpose criterion). This includes all microbial and other biological agents or toxins and their means of delivery (with exceptions for medical and defensive purposes in small quantities).

Subsequent Review Conferences have reaffirmed that the general purpose criterion encompasses all future scientific and technological developments relevant to the Convention. It is not the objects themselves (biological agents or toxins), but rather certain purposes for which they may be employed which are prohibited; similar to Art.II, 1 in the Chemical Weapons Convention (CWC).

Permitted purposes under the BWC are defined as prophylactic, protective and other peaceful purposes. The objects may not be retained in quantities that have no justification or which are inconsistent with the permitted purposes.

As stated in Article 1 of the BWC: "Each State Party to this Convention undertakes never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

(1) Microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;

(2) Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict."

Summary

Article I: Never under any circumstances to acquire or retain biological weapons.

Article II: To destroy or divert to peaceful purposes biological weapons and associated resources prior to joining.

Article III: Not to transfer, or in any way assist, encourage or induce anyone else to acquire or retain biological weapons.

Article IV: To take any national measures necessary to implement the provisions of the BWC domestically.

Article V: To consult bilaterally and multilaterally to solve any problems with the implementation of the BWC.

Article VI: To request the UN Security Council to investigate alleged breaches of the BWC and to comply with its subsequent decisions.

Article VII: To assist States which have been exposed to a danger as a result of a violation of the BWC.

Article X: To do all of the above in a way that encourages the peaceful uses of biological science and technology.

Membership

The Biological Weapons Convention has 162 States Parties and unofficially, the Republic of China (Taiwan).

Several countries have declared reservations, in that their agreement to the Treaty should not imply their complete satisfaction that the Treaty allows the stockpiling of biological agents and toxins for 'prophylactic, protective or other peaceful purposes', nor should the Treaty imply recognition of other countries they do not recognise.

Review Conferences

A long process of negotiation to add a verification mechanism began in the 1990s. Previously, at the second Review Conference of State Parties in 1986 member states agreed to strengthen the treaty by reporting annually Confidence Building Measures (CBMs) to the United Nations. The following Review Conference in 1991 established a group of government experts (known as VEREX). Negotiations towards an internationally-binding verification protocol to the BWC took place between 1995 and 2001.

At the Fifth Review Conference in 2001 however, the Bush administration, after conducting a review of policy on biological weapons, decided that the proposed protocol did not suit the national interests of the United States.

The US claiming that it would interfere with legitimate commercial and biodefense activity unlike most arms control agreements, the BWC also applies to private parties. The Fifth Review Conference took place in November/December 2001, shortly after 9/11 and the anthrax scare.

It was decided to suspend the Fifth Review Conference and reconvene the following year. At the resumed conference it was agreed to establish annual meetings of state parties and experts who would look at specific issues, including:

2003: National mechanisms to establish and maintain the security and oversight of pathogenic micro-organisms and toxins.

2004: Enhancing international capabilities for responding to, investigating and mitigating the effects of cases of alleged use of biological or toxin weapons or suspicious outbreaks of disease.

2004: Strengthening and broadening the capabilities for international institutions to detect and respond to the outbreak of infectious diseases (including diseases affecting plants and animals).

2005: Codes of conduct for scientists.

Fissile Material Cut-off Treaty

The Fissile Material Cutoff Treaty (FMCT) is a proposed international treaty to prohibit the further production of fissile material for nuclear weapons or other explosive devices. The treaty has not been negotiated and its terms remain to be defined. According to a proposal by the United States, fissile material includes high-enriched uranium and plutonium (except plutonium that is over 80% Pu-238).

According to a proposal by Russia, fissile material would be limited to weapons-grade uranium (with more than 90% U-235) and plutonium (with more than 90% Pu-239). Neither proposal would prohibit the production of fissile material for non-weapons purposes, including use in civil or naval nuclear reactors.

In a 27 September 1993 speech before the UN, President Clinton called for a multilateral convention banning the production of fissile materials for nuclear explosives or outside international safe-

guards. In December 1993 the UN General Assembly adopted resolution 48/75L calling for the negotiation of a "non-discriminatory, multilateral and international effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices."

The Geneva based Conference on Disarmament (CD) on 23 March 1995 agreed to a establish a committee to negotiate "a non-discriminatory, multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices.". However, substantive negotiations have not taken place.

In 2004, the United States announced that it opposed the inclusion of a verification mechanism in the treaty on the grounds that the treaty could not be effectively verified. On November 4, 2004. the United States cast the sole vote in the First Committee of the United Nations General Assembly against a resolution (A/C.1/59/L.34) calling for negotiation of an effectively verifiable treaty.

The Bush Administration supported a treaty but advocated an ad hoc system of verification wherein states would monitor the compliance of other states through their own national intelligence mechanisms.

On April 5, 2009, U.S. President Barack Obama reversed the U.S. position on verification and proposed to negotiate "a new treaty that verifiably ends the production of fissile materials intended for use in state nuclear weapons."

On May 29, 2009, the CD agreed to establish an FMCT negotiating committee, However, Pakistan blocked the CD from implementing its agreed program of work, despite severe pressure from the major nuclear powers to end its defiance of 64 other countries in blocking international ban on the production of new nuclear bomb-making material, as well as discussions on full nuclear disarmament, the arms race in outer space, and security assurances for non-nuclear states.

Nuclear-weapon-free zone

A Nuclear-Weapons-Free Zone, or NWFZ is defined by the United Nations as an agreement which a group of states has freely established by treaty or convention, that bans the use, development, or deployment of nuclear weapons in a given area, that has mechanisms of verification and control to enforce its obligations, and that is recognized as such by the General Assembly of the United Nations.

NWFZs do not cover international waters (where there is freedom of the seas) or transit of nuclear missiles through space, as opposed to deployment that stations nuclear weapons in space. The NWFZ definition does not count countries or smaller regions that have outlawed nuclear weapons simply by their own law, like Austria with the Atomsperrgesetz in 1999; also, the 2+4 Treaty, at the end of the Cold War, banned nuclear weapons in the former East Germany, but was an agreement only among the four Allies and two German states.

NWFZs have a similar purpose to, but are distinct from, the Nuclear Non-Proliferation Treaty to which all countries except for four nuclear weapons states are party.

Today there are five zones covering continental or subcontinental groups of countries (including their territorial waters and airspace), one UN-recognized zone consisting of a single country, Mongolia, and three governing Antarctica, the seabed, and outer space which are not part of any state. The Antarctic, seabed, and space zones actually preceded most of the zones on national territories.

As of 15 July 2009 (2009 -07-15)[update] when the African zone came into force, the six land zones cover 56% of the Earth's land area of 149 million square kilometers (less of the Earth's oceans above the seabed are covered since freedom of the seas restricts restrictions in international waters) and 60% of the 193 states on Earth, up from 34% and 30% the previous year; however only one third of the world's population lives in NWFZs, while the nine nuclear weapons states have 28% of world land area area and 48% of world population.

NWFZs do cover most territories belonging to nuclear weapons states that are situated inside NWFZ boundaries; all are small islands except for French Guiana. However, the U.S. signed but has not ratified Protocol I to the Treaty of Rarotonga which would apply to American Samoa and the U.S. and Britain dispute the African NWFZ's applicability to Diego Garcia which is an American military base.

There have been NWFZ proposals for other regions where there are few or no nuclear weapons states: the Middle East (e.g. Nuclear program of Iran#Nuclear Free Zone in the Mideast), the Korean Peninsula, Central Europe, South Asia, and the Arctic.

Boundaries

The Antarctic, Latin American, and South Pacific zones are defined by lines of latitude and longitude, except for the northwestern boundary of the South Pacific zone which follows the limit of Australian territorial waters, and these three zones form a contiguous area, though treaty provisions do not apply to international waters within that area.

In contrast, the Southeast Asian zone is defined as the territories of its members including their Exclusive Economic Zones, and the African zone is also defined as the countries and territories considered part of Africa by the OAU (now the African Union) which include islands close to Africa and Madagascar. An AU member, Mauritius, claims the British Indian Ocean Territory where Diego Garcia is currently a US military base.

Geographical zones and NWFZs

Southern Hemisphere, High seas in blue.
Because few prevailing winds cross the Equator, effects of nuclear explosions in the Northern Hemisphere might send less fallout to the Southern Hemisphere. (This fact was used in the book and film On the Beach, although there the Southern Hemisphere eventually succumbs as well.)

Together the five southern NWFZs cover the Southern Hemisphere except for the area north of the 60th parallel south, east of the 20th meridian west, and west of the 115th meridian east, but outside of African, Australian or Indonesian territorial waters.

There is less than 8000 km² of land in this area:
Addu, the southernmost of the atolls of the Maldives

Chagos Islands (British Indian Ocean Territory) including Diego Garcia (disputed by Mauritius)

Kerguelen, Crozet, Saint Paul and Amsterdam Islands, some of the French Southern Territories in the southern Indian Ocean

St. Helena and its dependencies Ascension Island and Tristan da Cunha, a British overseas territory in the South Atlantic

Bouvet Island, a Norwegian territory in the South Atlantic

In 1994 states of the South Atlantic Peace and Cooperation Zone issued a "Declaration on the Denuclearization of the South Atlantic" which the U.N. General Assembly endorsed but the U.S., U.K., and France still opposed.

Tropics

The Latin American, African, South Pacific and Southeast Asian zones also cover most land in the tropics, but not some Northern Hemisphere areas south of the Tropic of Cancer. Most of their land area is in India and the Arabian Peninsula.

Little of the land area covered by the five southern Nuclear-Weapon-Free Zones extends north of the Tropic of Cancer: only northern Mexico, northern Bahamas, northern Myanmar, and North Africa. However, the Central Asian and Mongolian zones are entirely in the North Temperate Zone.

Nuclear power and

programs

Argentina, Brazil, Mexico, and South Africa, are the only countries in the zones using nuclear power for electricity, with two nuclear plants each. South Africa formerly had a nuclear weapons program which it terminated in 1994.

Argentina and Brazil are known to operate uranium enrichment facilities. Countries that had enrichment programs in the past include Libya and South Africa, although Libya's facility was never operational. Australia has announced its intention to pursue commercial enrichment, and is actively researching laser enrichment.

Another term, Nuclear-free zone, often means an area which has banned both nuclear power and nuclear weapons, and usually does not mean a UN-acknowledged international treaty.