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Conclusion of effective international arrangements to assure non-nuclear weapon states against the use of threat of use of nuclear weapons.

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INTRODUCTION

A decade after the end of the Cold War, at the threshold of the 21st Century, the fabric of international security is showing signs of unravelling. Relations among major powers are deteriorating. The United Nations is in political and financial crisis. The global efforts for the proliferation of nuclear weapons and other weapons of mass destruction (WMD) are practically under siege. Nuclear tests by India and Pakistan have shown that not all countries share the view that the usefulness of nuclear weapons is declining. Years of relentless efforts have not eliminated the clandestine WMD programs of the most determined proliferators. The US-Russia nuclear disarmament process is stalled, with negative consequences for the global disarmament agenda. The situation in Asia is particularly unstable, portending negative changes for disarmament and non-proliferation in coming years. Political violence is taking an increasingly worrisome turn, with the possible advent of sub-state terrorist groups armed with weapons of mass destruction and economic crises, sweeping over continents, generate instability and unpredictability well beyond in domestic markets.

Relations among major powers, a primary factor in world order, are crucial for the future of nuclear non-proliferation and disarmament. Following a short rapprochement, relations between the United States and Russia have deteriorated. The United States no longer has a matching rival, and is perceived as a sole military superpower. Russia, concerned about its status, has revalued nuclear weapons.

Recent advances in science and technology have made chemical and biological weapons more accessible. Furthermore, the bio-science revolution has opened possibilities for the making of a new generation of biological weapons which are more dangerous and difficult to protect against. Some of this activity is difficult to distinguish from legitimate civilian research, which makes proliferation harder to prevent. In the proliferation of nuclear weapons and other weapons of mass destruction, increasingly complex methods of concealment and sources of supply are used. Delivery systems are also giving rise to increased concern, as missiles with extended ranges and increased launch readiness become more accessible. The uses proposed for nuclear weapons by the new nuclear-armed states are unclear; those of potential proliferators of biological weapons even more so. As a consequence, profound questions must now be raised concerning the new WMD arsenals. Are they intended as weapons of last resort? Are they seen as decisive weapons for use against countries armed with advanced conventional capabilities? Are they for the ultimate protection of authoritarian regimes? Or are they seen as instruments of regional domination?

Terrorism using nuclear, chemical or biological weapons has been possible for some time, but serious policymakers have traditionally seen other threats as more pressing. This perception has been changing since the early 1990s. The probability of WMD terrorism may still be relatively low, but it is growing with the ability of sub-state terrorist groups to master the technical challenges of developing and using these weapons, and their growing access to the very significant monies obtained from the traffic in illicit drugs. National controls on weapons-grade fissile materials were tight during the Cold War; now it is increasingly possible that non-state actors might obtain them. The prospect of WMD terrorism is particularly alarming because it is hard to prevent and the perpetrators hard to identify. The effects of WMD terrorism could be so severe that it must be regarded as a serious security challenge for the coming decades. Trends in political violence and a propensity toward inflicting mass casualties appear to be rising in recent years. Chemical weapons have already been used against civilian populations in internal conflicts, setting a dangerous precedent, especially when civilian casualties and displacement are war aims in some ethno-nationalist conflicts.

It will be hard to maintain stability and nuclear security under these circumstances. It will require a vision and a roadmap of how these complex issues can be solved. It will also require, at the global and regional level, new initiatives to stop the spread of nuclear weapons and new spheres of strategic cooperation among major powers. The world has witnessed a decade of unexpected challenges and disturbances since the end of the Cold War. As a new century begins, there is a strong risk that the world will become more chaotic and troubled, threatening the security of all, unless work begins now to turn recent setbacks into potential solutions. This calls for understanding the stakes, and putting in place new means of maintaining stability, reducing WMD threats and increasing transparency

BASICS ON NUCLEAR WEAPONS

Basic Terms:

Atom: The smallest particle of matter that can have the properties of a chemical element. Atoms are composed of protons (positively charged particles), electrons (negatively charged particles), and neutrons (uncharged particles). Protons and neutrons are heavy particles that are found in an atom's nucleus (the core). Electrons, which are much smaller and lighter, orbit the nucleus Source: http://www.academicpress.com

Fission: The splitting of the nucleus of an element into fragments. Heavy elements such as uranium or plutonium release energy when fissioned.

Fusion: The combining of two nuclei to form a heavier one. Fusion of the isotopes of light elements such as hydrogen or lithium gives a large release of energy.

Radiation: Radiation is any energy that is emitted from some source and travels through space. This includes things such as light, sound, and heat. The radiation typically referred to when discussing nuclear weapons or nuclear energy is ionizing radiation, which comes from unstable atoms. To become stable, unstable atoms emit radiation in the form of particles, such as alpha and beta radiation, or in the form of electromagnetic waves, such as gamma radiation and X-rays. Source: http://www.orau.gov/reacts/define.htm

Alpha Radiation: Radiation consisting of helium nuclei (atomic wt. 4, atomic number 2) that are discharged by radioactive disintegration of some heavy elements, including uranium-238, radium-226, and plutonium-239.

Beta Radiation: Radiation consisting of electrons or positrons emitted from atoms at speeds approaching the speed of light.

Gamma Radiation: Electromagnetic waves released during radioactive decay that can ionize atoms and split chemical bonds.

Rad: A unit of absorbed dose of radiation defined as deposition of 100 ergs of energy per gram of tissue. It amounts approximately to one ionization per cubic micron.

Chain Reaction: The process of nuclear fission in which the neutrons released trigger other nuclear fission reactions at the same or greater rate. In a nuclear weapon, an extremely rapid multiplying chain reaction causes an explosive release of energy. In a nuclear reactor the pace of the chain reaction is controlled to produce heat (in a power reactor) or large quantities of neutrons (in a research or production reactor)

Critical Mass: The amount of a fissile substance that will allow a self-sustaining chain reaction. The amount depends both on the properties of the fissile element and on the shape of the mass.

Atom Bomb: A nuclear bomb whose energy comes from the fission of uranium or plutonium

Hydrogen Bomb: A nuclear weapon that derives its energy from the fusion of hydrogene

Immediate Aftermath of a Nuclear Explosion

A nuclear explosion produces several distinct forms of energy that have damaging effects: blast, thermal radiation, electromagnetic pulse, direct nuclear radiation, and fallout. The extent of damage will depend on various factors, including the size of the nuclear weapon, the height at which it is detonated, and the geography of the target.

Extent of damage:

The extent of damage depends on the size of the nuclear weapon, the terrain and the height at which it is detonated. Nuclear weapons detonated at ground level generate more fallout as a result of the large amount of ground material which is irradiated by the explosion and thrown in the air, but the effects of thermal radiation and radioactive waves is less than in an air blast.

The nuclear weapon detonated in Hiroshima was about 12kt, i.e. the equivalent of 12,000 tons of TNT. The combined effects of blast, and radiation killed about 300,000 people. Current nuclear weapons range in size from 1 kt to over 1000 kt. Most are about 100kt, i.e. about 10 times the force of the Hiroshima bomb.

Effects of Radiation on Humans

The effects of radiation on the human body vary, depending on the dosage of radiation, and whether exposure is slow and protracted or large and instantaneous.

Radiation affects cells in the human body that actively divide (e.g. hair, intestine, bone marrow, reproductive organs). The most frequent kind of radiation exposure is exposure of small areas of the body. Damage in localized tissue and to blood vessels in the exposed areas can lead to disturbed organ functioning. Higher doses cause gangrene and/or death of localized tissue.

A large, rapid dose of radiation causes cell death, and effects are immediately apparent - within hours, days, or weeks. With protracted exposure, cells can do some repair over the exposure period. Protracted exposure is generally better tolerated, even when the total dose is high. (It is impossible to measure how much radiation a person has been exposed to over an extended period of time). Radiation doses low enough to avoid cell damage can still induce cellular changes that may be clinically detected sometime in the future, and could potentially be passed on through defective genes.

With radiation exposure due to internally deposited radiation, effects are delayed, and degeneration or destruction of the irradiated tissue may not be as severe. The initiation of cancer is possible, depending on the affected organ and the nature of the radioactive element (its half-life, radiation characteristics, and biochemical behaviour).

High whole-body doses of radiation produce a characteristic pattern of injury. Doses are measured in rads.

Extremely high doses: 4000-5000 rads

Radiation exposure in this range severely damages the vascular system. It also causes accumulation of fluid in the brain (cerebral edema), leading to central nervous system syndrome. Symptoms include nausea, vomiting, explosive diarrhea, convulsions, and progressive impairment of cognitive and motor skills. A person exposed to this amount of radiation will enter a coma and die within 48 hours.

High doses: 1000-4000 rads

In this range of radiation exposure, vascular damage is less severe, but there is also a loss of fluids and electrolytes in intercellular spaces and the gastrointestinal tract. Death occurs within ten days, due to fluid and electrolyte imbalance, severe bone-marrow damage, and terminal infection.

Moderate doses: 400-1000 rads

Exposure in this range causes a gastrointestinal form of radiation sickness, with symptoms of nausea, vomiting, and diarrhea. Radiation in this range also destroys bone marrow and disrupts its production of blood cells, leading to infection as the white blood cells count decreases. There would also be a drop in the number of platelets (cell fragments that help blood to clot), which would allow massive haemorrhaging. Death is probable and will occur in approximately four to five weeks.

Low Doses: 100-400 rads

Low doses of radiation cause problems similar to those of moderate exposure. Nausea, vomiting, and diarrhea symptoms cease after a few days. Treatment for radiation exposure in this range can be effective, but death is still a possibility.

Acute Radiation Syndrome (see Extremely High Doses and High Doses above) Acute radiation syndrome is sickness caused by irradiation of most or all of the body, whether in one large dose or through exposure over time (although it is impossible to measure the amount of radiation a person has accumulated over an extended period of time). Symptoms will be more immediately apparent in the case of a large dose in a short period. Encompassing the most severe effects of radiation exposure, acute radiation syndrome requires immediate medical attention. Without medical treatment, survival is highly unlikely.

Initially patients experience fatigue, loss of appetite, nausea, vomiting, and diarrhea for a day or two. If the dose of radiation is very high, there may also be symptoms such as fever and respiratory problems. Symptoms then disappear for several days to several weeks, after which the illness becomes severe.

Radiation inhibits reproduction of blood cells, leading to bleeding and anemia as the number of red blood cells decreases, and inability for wounds to heal as blood clotting factors are lost. A decreased white blood cell count hinders the body's immune system and leads to more infections.

There may also be a loss of fluids, electrolytes, and intestinal lining. In more serious cases, accumulation of fluid in the brain can lead to central nervous system syndrome, with symptoms of nausea, vomiting, and diarrhea.

Other symptoms may include temporary sterility in males, clouding in the lens of the eye, and loss of hair. Hair loss occurs because damage to hair-root cells causes hairs to become thinner and break off.

Late Effects

Delayed effects of radiation exposure, largely secondary to blood vessel damage, are the impaired functioning of and degenerative changes in many organs, particularly bone marrow, kidneys, lungs, and the lens of the eye.

The most serious late effect of radiation exposure is a significantly increased incidence of leukaemia and thyroid, lung, and breast cancers (compared to the average figure among people exposed to doses of less than 100 rads).

There is also an increased incidence of leukaemia, lung cancer, radiation-induced anaemia, and bone cancer among people exposed to lower doses of radiation. The type of cancer depends on how the radiation exposure occurs. For example, there was a high incidence of lung cancer among uranium mine workers, who inhaled radioactive dust. Watch painters at the turn of the century licked their radioactive paintbrushes, leading to a high incidence of bone cancer and radiation-induced anaemia. There is also a very high incidence of leukaemia among Hiroshima survivors who were exposed to 100+ rads.

Radiation exposure can also cause cataracts and hair loss, and increase the risk of infertility and birth defects.

GLOBAL STOCKPILES

There are currently about 31,000 nuclear warheads deployed or in reserve in the stockpiles of eight countries: China, France, India, Israel, Pakistan, Russia, the United Kingdom and the United States. Of these about 13,000 are deployed and 4,600 of these are on high alert, i.e. ready to be launched within minutes notice. The combined explosive yield of these weapons is approximately 5,000 megatons, which is about 200,000 times the explosive yield of the bomb used on Hiroshima.

Note: There are sometimes variances in numbers cited for stockpiles due to uncertainties of the status of some weapons, i.e. whether they are deployed, in non-active reserve, or dismantled.

United Kingdom

In July 1998 Britain's Labour government announced several changes to its nuclear forces following a Strategic Defence

Review:

Only one British submarine will patrol at any given time carrying 48 warheads. The submarine will patrol at a reduced state of alert - capable of firing its missiles within several days instead of within several minutes. Britain will maintain fewer than 200 operationally available warheads.

The weapons are configured flexibly in order to obtain a low yield for "sub-strategic missions" or higher yields for strategic missions.

China

Bombers: China's bomber force is reportedly antiquated based on Chinese-made versions of outdated Soviet aircraft. A supersonic fighter-bomber currently being developed is not believed to have a nuclear mission.

Ballistic Missiles: China uses liquid fuelled missiles which would take some time to prepare for launch, and reportedly stores the warheads separate from these missiles. However, a solid fuelled missile, the DF-31, is under development. Each missile carries one warhead. However, China has the technical capability to develop multiple re-entry vehicles and could deploy these in response to US development of Ballistic Missile Defence.

Non-strategic warheads: There is no official evidence of existence of non-strategic weapons. However, the US Defence Intelligence Agency believes that China has developed nuclear artillery, demolition munitions and nuclear capable short-range missiles. Land attack cruise missiles currently under development might be nuclear capable.

Warheads: China's strategic weapons have high yields - mostly in the megaton range - but are not as accurate as those of the US or Russia. It is believed that China has developed a neutron bomb.

France:

Bombers: Both the Navy and Air force deploy nuclear capable aircraft. France is developing a new nuclear capable fighter-bomber, the Rafale.

Submarines: France has four nuclear capable submarines, two of the Triumphant class, one Inflexible class and one redoubtable class. Two more Triumphant class submarines are currently being built.

France dismantled its 18 intermediate range missiles from 1996-98. The nuclear testing facilities at Moruroa and Fangataufa were closed following France's accession to the CTBT. France ceased production of plutonium and highly enriched uranium in 1992 and 1996 respectively.

United States:

Intercontinental ballistic missiles: Under START II, all operational MX missiles are to be deactivated by 2007. Despite their planned deactivation, MXs continue to be flight tested under the Force Development and Evaluation Program. Minuteman III missiles continue to be upgraded. The Guidance Replacement Program will extend the life of the guidance system beyond the year 2020 and improve Minuteman III accuracy to near that of the current MX--a circular error probable of 100 meters.

Submarine launched ballistic missiles:

a) Modernisation. All Trident I submarine-launched ballistic missiles (SLBMs) are expected to be replaced with longer-range and more accurate Trident II D5s by 2006.
b) Numbers. Under START II arrangements, SLBMs will be allowed to carry no more than 2,160 warheads by the end of 2004, and no more than 1,750 by the end of 2007

Bombers: Long-range bombers are equipped with air launched cruise missiles and free fall bombs. The B-2 bomber is capable of carrying the B61-11, an earth-penetrating nuclear bomb, introduced in November 1997. The US is continuing to produce nuclear capable advanced cruise missiles (ACM)

Non-strategic forces: Nuclear weapons were removed from surface ships in 1991. However, the US maintains a robust stockpile of tactical nuclear weapons in Europe and on its territory and is not expected to reduce these while Russia maintains a large stockpile.

Stockpile: In addition to the active stockpile, the U.S. maintains a large inactive stockpile as a "hedge" in case arms control expectations fail to materialise.

Russia:

Intercontinental ballistic missiles: Russia is continuing to test and modernise its SS-27 missile.

Submarines: Russia has reduced its operational nuclear submarines from 62 in 1990 to 17 in 2001. All Delta I and Delta II subs have been withdrawn from service. Russia continues to produce SS-N-23 SLBMs to keep the Delta IVs in service.

Non-strategic forces: Russia agreed to remove tactical nuclear weapons from surface ships in 1991, but there is no confirmation that this has happened. Russia keeps a large stockpile of additional tactical weapons in regional storage sites. There has been a strong call from sectors of the government and military to increase reliance on tactical weapons in response to NATO's eastward expansion and to offset NATO's superior conventional forces.

Israel:

Israel neither acknowledges nor denies that it has nuclear weapons. Israel is generally regarded as a de facto nuclear weapon state. Mordechai Vanunu, a former nuclear technician at the Dimona facility, revealed that Israel could have up to 200 nuclear warheads (Revealed: The Secrets of Israel's Nuclear Arsenal, Sunday Times, London, October 5, 1986). Vanunu also reported that Israel had produced tritium and lithium, indicating that Israel may have developed boosted nuclear weapons. Seymour Hersh has claimed that Israel has developed low-yield weapons for artillery and land-mines, as well as thermo-nuclear weapons (The Sansom Option, Random House, New York, 1991). Some analysts assume that Israel could not have advanced to the point of producing thermonuclear weapons because they are not known to have conducted any physical nuclear testing.

However, it is reported that Israel has been able to acquire data on thermonuclear tests from France and the U.S. Israel currently deploys two nuclear capable ballistic missile systems: the Jericho I (range 660 km) and the Jericho II (range 1500 km). In addition, the Shavit space launch vehicle could be modified to carry nuclear weapons giving it an intercontinental capability (range 7800 km).

India:

India demonstrated a nuclear weapons capability in 1974 by detonating a device in what it called a peaceful nuclear experiment. Then in May 1998, India openly tested nuclear weapons and declared itself a nuclear weapons power. India has enough separated weapons grade plutonium to make about 85 nuclear warheads.

India has developed two missiles which could be adapted to nuclear capability. They are the Prithvi (range 200 km) and the Agni (range 1,500 - 2,500 km). India has also been enhancing its nuclear air-delivery capability by purchasing and re-producing the Russian Su-30MK fighter-bomber. In addition, India claims to be developing a submarine launched ballistic missile known as Sagarika, and nuclear capable cruise missiles.

Pakistan:

Pakistan is believed to have started developing its nuclear weapons program in 1971, following its war with India. By1998, it was believed that Pakistan had built a small arsenal of unassembled nuclear weapons. In response to the Indian tests of May 1998, Pakistan followed with nuclear tests itself in Chagai Hills. It is now possible that Pakistan would have built and assembled up to 25 nuclear warheads.

Pakistan possesses about 30 nuclear capable surface-to-surface missiles provided by China. Pakistan has built and tested its own ballistic missiles including the Haft-3 (range 600 km) and the Ghauri (range 1500 km).

Nuclear Deterrence

Nuclear deterrence aims to prevent unwanted action by an opponent by convincing them that the resultant costs would exceed any gains. In short, the costs would involve massive destruction from a nuclear strike.

Nuclear deterrence involves several paradoxes. For example, the threat of use of nuclear weapons is supposed to prevent war, including the use of nuclear weapons. This is to what the academic term "Balance Of Terror" refers to. But to be credible, the deterring state must demonstrate a readiness to use nuclear weapons, which increases the probability of such use, particularly over a long period of time. Thus, nuclear deterrence is an inherently unstable policy.

Nuclear deterrence has evolved from the simple threat of massive retaliation to a range of forms. It includes: counter-force; the threat of nuclear retaliation against military targets, counter-value; the threat of nuclear retaliation against the opposing state in general, flexible response; the deployment of sub-strategic or tactical weapons for battlefield use or for use as an interim step prior to massive retaliation; first-strike; the use of nuclear weapons in response to a conventional attack or to pre-emptively destroy the weapons of an opponent, extended deterrence; the extension of nuclear deterrence to cover the territories of non-nuclear allies, existential deterrence; the ability to develop nuclear weapons without actual deployment.

PROLIFERATION

Argentina

Although Argentina never produced or used nuclear weapons, from the 1960s to 1990s, Argentina's uranium-based nuclear program and its ballistic missile program were the source of international concern. This concern was mainly based on the stated intention of the Argentine government to build nuclear weapons, and to proliferate missile technologies to other countries. Moreover, Argentina refused to join the nuclear Non-Proliferation Treaty (NPT) until February 1995, and its nuclear facilities were not covered by any safeguards agreement in the 1960s and 1970s.

When authoritarian rule ended in the early 1980s, the nuclear program was placed under civilian control. A policy of rapprochement with Argentina's regional rival Brazil led to the creation of a bilateral inspections body for nuclear materials and sites in both countries called the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC). Under pressure from the United States, the Argentine government began to dismantle its missile program in 1993 and joined the Missile Technology Control Regime (MTCR), as well as various export control groups. The accession to the Treaty of Tlatelolco in 1994 and the NPT in 1995 led to further adherence to international non-proliferation norms.

Brazil

From the 1970s to 1990s, Brazil's nuclear energy and missile programs raised several concerns with the international community. Brazil refused to join the nuclear Non-Proliferation treaty (NPT) until 1997, and its nuclear program was initially based on an unsafe guarded uranium enrichment facility. In 1975, the Brazilian military launched a covert nuclear weapons program called the "Parallel Program," which produced two nuclear weapons. The Parallel Program was exposed to the public in 1988 and shut down in 1990. It was later revealed that Brazil secretly sold eight tons of uranium to Iraq in 1981.

The easing of the Argentine-Brazilian nuclear rivalry in the 1980s and 1990s allowed for greater transparency regarding the Brazilian nuclear program. The Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) of 1990 and other bilateral agreements established a safeguards system to verify the peaceful uses of nuclear energy in both countries.

In spring 2004, Brazil faced criticism over its conduct with the International Atomic Energy Agency (IAEA) when it didn't allow for full IAEA access to its uranium enrichment facility. The IAEA had raised the concern that Brazil may have acquired nuclear materials through the A. Q. Khan network. Moreover, the Brazilian government announced a plan to expand its enrichment activities for domestic use and sale to other countries. At the same time, Brazil maintained that its nuclear program only serves peaceful purposes. The dispute was resolved in November 2004 when Brazil allowed for unhindered IAEA inspections of its uranium enrichment site.

Egypt

Egypt started its nuclear energy program in 1954 with initial help from the Soviet Union and later from Argentina. Egypt signed the nuclear Non-Proliferation Treaty (NPT) in 1968 and ratified it in 1981 after more than a decade of delay. In the late 1960s, evidence about Israel's nuclear weapons capabilities surfaced, which may have delayed Egypt's accession to the NPT.

Egypt is not engaged in any serious nuclear weapon activities, and focuses its efforts on improving its conventional forces.

Egypt remains the strongest critic of Israel's status as a de facto nuclear power and urges for the establishment of a nuclear-weapon-free zone in the Middle East (MENWFZ). Egypt put forward its first proposal for a MENWFZ in 1974.

In early 2005, Egypt admitted its failure to report past nuclear activities and materials to the International Atomic Energy Agency (IAEA) in a timely fashion. IAEA inspections verified the lack of reporting through a series of inspections in 2004 and 2005, which removed concerns about possible nuclear weapon activities.

China

China acceded to the nuclear Non-Proliferation Treaty (NPT) as a nuclear-weapon state (NWS) in 1992 and is the only NWS that has ratified the International Atomic Energy Agency (IAEA) Additional Protocol. The Chinese nuclear program started in the mid-1950s. In 1964, China conducted its first nuclear weapon test. China possesses some 400 nuclear weapons and a variety of short-range and intercontinental ballistic missiles. It is the only nuclear weapons state to adhere to a policy of no-first use of nuclear weapons.

Although China has sponsored many disarmament resolutions in the United Nations, it is proceeding with modernizing its nuclear arsenal, in addition to increasing its military capabilities. Specifically, China is modernizing its missile force to include an emerging cruise missile capability. Despite promises to do so, China has not ratified the Comprehensive Test Ban Treaty and continues to maintain its nuclear test site. Many analysts attribute China's nuclear modernization efforts to the

US development and deployment of ballistic missile defenses, which undermine China's minimum deterrence capacity.

China's role as a proliferator to countries such as Pakistan and Saudi Arabia in the 1980s and 1990s prompted the United States to exert pressure on the country to adhere to international non-proliferation treaties, and especially export controls regime. Even though China is still not member to regimes such as the Missile Technology Control Regime (MTCR) or the Nuclear Suppliers Group (NSG), it managed to close the major gaps in its domestic export controls regulations by 2002.

Acting as a mediator between the United States and North Korea, China has been one of the main players in the Six-Party talks on North Korea's nuclear weapons program.

Iran

In the recent past, Iran has been under intense scrutiny by the International Atomic Energy Agency (IAEA) over its nuclear energy program. Past failure to declare all nuclear facilities and materials in a timely fashion, as revealed in 2002 and 2003, have led to increased concerns among the international community that Iran intends to secretly develop nuclear weapons.

Iran is a member to the nuclear Non-Proliferation Treaty (NPT) and concluded the comprehensive safeguards agreement with the IAEA in 1974. Iran signed the Additional Protocol in 2003, but has not yet ratified it. Iran started its civilian nuclear energy program with assistance from the United States in the 1970s. Iranian nuclear facilities include an uranium enrichment plant in Natanz, and a heavy water reactor near Arak, both of which were concealed from the IAEA until 2002. In 2003, the IAEA announced that Iran had breached its safeguards agreement by failing to fully declare its nuclear activities. Furthermore, IAEA inspectors found traces of enriched uranium on centrifuges imported from Pakistan. Iran claims the contamination stems from the centrifuges' earlier use in Pakistan and denies having tested them with uranium.

Suspicions on part of the IAEA and Western states prompted by these clandestine activities are compounded by Iran's plans to master the nuclear fuel cycle. Iran asserts that its nuclear program is for civilian energy purposes only and continues to cite its inalienable right to pursue peaceful energy under Article IV of the NPT.

Many countries suspect that Iran might be misusing Article IV of the NPT to obtain nuclear weapons capabilities and have expressed doubts regarding Iran's stated need for pursuing sophisticated fuel cycle technologies. The United States, in particular, have been pushing for Iran's referral to the United Nations Security Council where Iran might face sanctions for its nuclear program.

Urged by IAEA Board of Governors resolutions issued in 2003, Iran is cooperating with the IAEA to allow for the verification of its stated peaceful nuclear program. Iran voluntarily suspended its uranium enrichment activities, and allowed for more intrusive IAEA inspections. Since the fall of 2004, Iran has also been engaged in renewed negotiations with the France, Germany, and the United Kingdom (also known as the EU-3), with the prospect of agreeing on a proposal by August 2005. According to an agreement reached in November of 2004, Iran continues to temporarily suspend its enrichment activities, but has repeatedly threatened to resume enrichment if the EU-3 talks remain fruitless.

Israel

Israel maintains a policy of opacity regarding its nuclear program, which started with French assistance in the late 1950s. The Israeli government neither confirms nor denies the possession of nuclear weapons, but it is believed that Israel possesses some 100-200 nuclear weapons, making it the fifth and possibly fourth largest nuclear power, ahead of Britain, and possibly ahead of France. No concrete evidence on nuclear testing is available. Israel is the only country in the Middle East that is not a member in the nuclear Non-Proliferation Treaty (NPT).

When US intelligence first discovered Israel's Dimona nuclear reactor in 1960, the US government failed to put a halt to Israeli nuclear activities. It is estimated that Israel had produced its first nuclear weapons by 1967, and started a missile program around the same time. Today, Israel also maintains a functioning missile defense system, the Arrow theatre missile defense system.

Regional players, especially Egypt and Iran, have repeatedly pressured Israel to disarm from its nuclear armory. Since the 1980s, the United Nations General Assembly (UNGA) has passed annual resolutions calling upon Israel to join the NPT as a non-nuclear weapon state. Israel's status as a de facto nuclear state is also a common theme of debate at NPT meetings. It is generally believed that a peaceful resolution to Middle Eastern affairs cannot be achieved without ending the Israeli nuclear program. The International Atomic Energy Agency (IAEA) has initiated a security dialogue with the Israeli government, seeking Israeli support for a Middle East Nuclear Weapons Free Zone. This would require Israel, which is a member of the IAEA, to give up its nuclear weapons.

Libya

On 19 December 2003, Libya publicly declared and then renounced its clandestine nuclear weapons program. This announcement came after 9 months of secret negotiations between the Libyan leader Muammar Qadhafi, the United Kingdom, and the United States. Libya was also pressured to eliminate its nuclear weapons program after the United States and its allies under the Proliferation Security Initiative (PSI) intercepted a shipment of enrichment centrifuges destined for Libya in October 2003.

Since the 1970s, Qadhafi had expressed strong interest in acquiring and building nuclear weapons in response to the Israeli nuclear program. Despite being a non-nuclear weapons state party to the Non-Proliferation Treaty (NPT) since 1975, Libya successfully procured nuclear weapons designs, natural uranium and centrifuges through the clandestine nuclear black market headed by Pakistani nuclear scientist Abdul Qadeer Khan. The NPT prohibits the transfer of such materials, and does not allow non-nuclear-weapons states to acquire them.

The United States and other countries helped dismantle the Libyan program by removing materials and information. After gaining access to nuclear sites in December 2003, the International Atomic Energy Agency (IAEA) confirmed the former existence of an incipient nuclear weapons program. It is estimated that Libya was still 3-7 years away from acquiring a nuclear weapons capability.

As an incentive for giving up its nuclear weapons program, in September 2004, the United States lifted economic sanctions that had been in place since the 1980s over Libya's sponsorship of terrorism.

North Korea

Identified as part of the axis of evil in 2002 by US President George W. Bush, the Democratic Peoples' Republic of Korea (DPRK), or North Korea, remains a source of grave international proliferation concern today. In January 2003, North Korea announced its withdrawal from the nuclear Non-Proliferation Treaty (NPT) after the International Atomic Energy Agency (IAEA) found it in non-compliance with its safeguards agreements in 2000. In February 2005, the DPRK government publicly claimed for the first time that it possesses nuclear weapons. Due to the extremely closed nature of the North Korean communist state, exact information on its nuclear capabilities is not available. It is believed that North Korea possesses enough separated plutonium for some six to eight nuclear weapons. More plutonium is present in the form of spent nuclear fuel rods at the Yongbyon nuclear reactor. However, it remains unclear whether North Korea has actually produced a nuclear warhead small enough to be mounted on a missile.

Numerous multilateral and bilateral efforts to engage North Korea diplomatically in response to its nuclear weapons program have remained fruitless. North Korea joined the nuclear Non-Proliferation Treaty in 1985 and concluded its safeguards agreement with the IAEA after much delay in April 1992. In May 1992, the first IAEA inspections of declared sites and facilities took place. In early 1993, the DPRK denied IAEA access to two suspect nuclear waste sites. In March 1993, North Korea announced its intention to withdraw from the NPT and further obstructed the work of IAEA inspectors. Bilateral negotiations initiated by the United States diffused the crisis and resulted in the Agreed Framework of 1994. Under this agreement, North Korea froze its plutonium program for almost a decade and allowed for IAEA verification of the freeze. However, neither the US nor North Korea was fully satisfied with the agreement reached and the Agreed Framework subsequently collapsed after President Bush came into office in 2001.

North Korea's extensive ballistic missiles program is based on short and medium-range missiles. A long-range missile test conducted in 1998 failed, but if further developed, the Taepo Dong may be able to deliver a small payload. North Korea's role as the leading exporter of ballistic missiles poses another reason for concern. It has sold missile technologies based on the Taepo Dong system to Egypt, Iran, Libya, Pakistan and Syria.

Renewed efforts to diplomatically resolve the crisis surrounding the North Korean nuclear program have been made through the Six-Party talks that started in August 2003. China, Japan, North Korea, Russia and the United States have engaged in three rounds of talks so far, but little progress has been made. After boycotting the last round of talks in the fall of 2004, North Korea approached the United States in June 2005 for a possible resumption of negotiations. North Korea and US officials blame each other for the deterioration of the talks. Negotiations on North Korea's nuclear program have become a cyclical pattern in which an agreement between the US and North Korea is reached in crisis, but with one country waiting for the other to act before fulfilling their own promises. There remains a deep lack of trust on both sides.

Because North Korea is not capable of matching US military strength, it views its nuclear program as a means of providing deterrence against a US military attack as well as a negotiating card for economic aid.

South Africa

South Africa's secret nuclear weapons program started in the early 1970s under the apartheid regime. The regime's decision to produce nuclear weapons was influenced by South Africa's international isolation and the deteriorating security environment in the region during the 1970s.

South Africa mastered the complete nuclear fuel cycle and built a limited nuclear deterrence of six nuclear weapons that were allegedly never intended for actual use.

After the fall of the apartheid regime in the late 1980s, the new government decided to stop the production of nuclear weapons and dismantle the entire weapons program. South Africa acceded to the nuclear Non-Proliferation Treaty (NPT) as a non-nuclear weapon state in 1991 and entered into a safeguards agreement, including the Additional Protocol, with the International Atomic Energy Agency (IAEA) the same year.

In 1993, President F W de Klerk publicly announced the former existence of the program, its dismantlement and accession to the NPT. Since then, South Africa has actively participated in NPT meetings, and advocated nuclear disarmament as a member of the New Agenda Coalition (NAC) since 1998.

Syria

Syria maintains a nuclear energy program it claims is only for peaceful purposes. It also maintains a ballistic missile program, which is believed to be in response to Israel's conventional and nuclear capabilities. In 2005, International Atomic Energy Agency (IAEAI) Director General ElBaradei stated that IAEA inspectors could not find any evidence that Syria is developing nuclear weapons. IAEA inspections carried out in June 2004 concluded that Syria was not involved in Pakistani nuclear scientist Abdul Qadeer Khan's network of illicit nuclear transfers.

Syria's ballistic missile program, which includes missiles capable of delivering chemical weapons, remains of serious international concern. It is also widely believed that Syria has an advanced chemical weapons and biological weapons program.

In 2004, the European Union (EU) and Syria finalized a trade agreement that requires Syria to work toward the non-proliferation of weapons of mass destruction.

CONCLUSION

A realistic dialogue on the most effective means to address underlying security concerns must replace outdated nuclear doctrines on the one hand and artificial disarmament deadlines on the other. The international community must find new approaches to reduce nuclear dangers in these troubled times. Non-proliferation norms will need to be strengthened if the regime is to be kept alive in the next century. Not only regional but also global security is at stake. The 1991 Gulf War showed how a regional conflict could have global implications. Nuclear non-proliferation and disarmament are not the preserve of the nuclear-weapon states or powers in troubled regions. The NPT is based on a contract involving all parties. While the nuclear-weapon states have to fulfill the Articles I, IV and VI and pursue nuclear disarmament, the non-nuclear-weapon states (NNWS) need to firmly support effective action in the most difficult cases of non-compliance. Concerted action by both groups is the only way to renew the partnership to reduce nuclear dangers. New approaches in US-Russia bilateral nuclear reductions and steps by China to cap its arsenal and fissile material stocks could assist progress towards multilateral negotiations on nuclear disarmament. At the same time, regional security threats in the Middle East and Northeast Asia need close attention, as do the security problems among India, Pakistan and China. These three areas are potential flashpoints where use of weapons of mass destruction cannot be dismissed.

A solution, according to Mr. Deutch, professor to the MIT is that countries that do not currently possess uranium enrichment or plutonium-reprocessing facilities would agree not to obtain any such facilities or related technologies and materials for an extended period of time. By the same logic, countries that do possess such facilities would agree not to provide them, or related equipment or technology, to countries that do not. In exchange, during this period they would receive, on attractive terms, guaranteed cradle-to-grave fuel services – specifically, fresh nuclear fuel supply and spent fuel removal – under an agreement signed by all those governments in a position to provide such services. The IAEA would apply safeguards to any fuel-cycle activities covered by the agreement in addition to its traditional safeguard duties on the reactors in the user states. Fuel-service transactions themselves, however, would be between commercial entities negotiating commercial contracts.

The Assured Nuclear Fuel Services Initiative offers something for everyone. Nuclear supplier states would obtain revenues and increased confidence in avoiding a proliferation incident in a third country whose actions could put the large and potentially growing fleet of nuclear power stations in operation around the world at risk (a 'proliferation Chernobyl'). User states would obtain cost-effective, guaranteed access to nuclear fuel and guaranteed relief from the burden of dealing with nuclear-waste management. And the world would gain an added measure of safety from the risk of weapons proliferation that the spread of inherently dangerous fuel-cycle facilities would bring.

This institutionalization of 'fuel-cycle states' and 'user states' poses obvious challenges: the security of fuel supply to user states; aspirations for fuel-cycle status as an indicator of technological leadership and for associated export revenue; and the political asymmetry, particularly when viewed against the backdrop of NPT distinctions between nuclear- and non-nuclear-weapons states. Yet these challenges, while difficult or perhaps even politically impossible to resolve at the level of principle and theory, may be far more tractable if they are addressed pragmatically and incrementally, in the context of a realistic pace of global nuclear power deployment today and in the foreseeable future. For example, as the nuclear marketplace has evolved, a division between suppliers and customers already exists. The United States, the European Union, Japan, Canada, China, India and Russia account for 69 about 85% of world nuclear energy capacity today, which is about 365,000 megawatts. There is no serious expectation that this total will change much for 10–15 years. There is no shortage of fuel-cycle capacity to serve this market. Indeed, imports of Russian-origin enriched uranium into Europe and the United States are currently limited on trade protection grounds. If Russia could freely market enriched uranium in the West, today there would be substantial enrichment overcapacity. For countries with relatively small nuclear energy programs (less than 25,000 megawatts or so), economics will almost always make indigenous enrichment and reprocessing facilities a higher cost option compared to purchasing fuel services on the international market.

Significant growth in nuclear power is quite possible in coming decades, increasing the market for fuel-cycle services. A detailed scenario developed by the MIT Study Group on the Future of Nuclear Power shows, however, that the share of nuclear power in these same countries that now account for 85% would still account for 80% of world nuclear capacity by 2050. In practice the membership of fuel-cycle states need not expand for some time to come. Beyond this group, only South Korea has and will have a large enough nuclear power deployment to entertain fuel cycle development on economic grounds (of course, its situation is tied to broader issues on the Korean Peninsula). Other countries, such as Brazil or Indonesia, could conceivably have substantial programmes around 2050.

Non-NPT signatories would continue to be excluded entirely from the ANFSI regime. NPT signatories that choose not to become user states should also find their nuclear options constrained, as the rules of the regime should ensure that regime members would not accept nuclear materials or services from governments outside the ANFSI. Nor should ANFSI members provide materials or services for new nuclear power plants to countries outside the regime.

This reality suggests starting the new arrangements with a simple 'stay-put' rule with regard to fuel-cycle status; that is, states already performing nuclear fuel services for commercial customers on the international market would be considered fuel-cycle states, while all others would be considered user states. This has the advantage of offering a relatively quick start without tortuous negotiations about 'permanent' criteria for fuel-cycle and user states. Fuel-cycle state status should be formally revisited at some prescribed time, far enough into the future to provide the stability and security that motivate the creation of the regime, but not so far as to deter governments from joining for fear of forfeiting their long-term options to develop a different nuclear industry. Given the long planning horizon common among utilities, manufacturers and nuclear fuel services providers in the nuclear industry – ten years is common – it would be plausible to launch the regime for an initial ten-year term, with a commitment to review the process in 2015. A somewhat longer initial term, such as 15 years, would be even better.

Ten or fifteen years hence we should have a much clearer picture of the future of nuclear energy and thus of the need for additional fuel-cycle facilities. By that time, governments will also have a better idea about their country's future energy needs, environmental challenges (including global warming), the role of nuclear power and progress in nuclear waste disposal. Moreover, the state of nuclear-weapons proliferation could be very different. In short, it is at least ten years too early to make definitive decisions about how to reorder the global alignment of nuclear suppliers and users. Attempting to do so will almost certainly ignite debates and passions that are more likely to strangle than to promote the prospects of this regime.

QUESTIONS A RESOLUTION MUST ANSWER

Any resolutions introduced have to deal with specific aspects of the issue, which will be the outcome of the debate that will take place. In order to have a first direction the resolution should answer three questions about the topic:

- First, who and from what should be protected?
- Secondly, who will be responsible for the implementations of these measures?
- Finally, what must be the remedies for those that violate the above measures?