Civil Nuclear Power and Nuclear Weapons Proliferation

Human society is too diverse, national passion too strong, human aggressiveness too deep-seated for the peaceful and the warlike atom to stay divorced for long. We cannot embrace one while abhorring the other; we must learn, if we want to live at all, to live without both.

Jacques-Yves Cousteau, 1976

- Nuclear power and weapons are like Siamese twins. Since international controls on nuclear proliferation began, Israel, India, Pakistan and North Korea have obtained nuclear weapons demonstrating the link between civil and military nuclear power.
- Both the International Atomic Energy Agency (IAEA) and the Nuclear Non-proliferation Treaty (NPT) embody an inherent contradiction - seeking to promote the development of 'peaceful' nuclear power whilst at the same time trying to stop the spread of nuclear weapons.
- Manufacturing a nuclear bomb requires fissile material - either uranium-235 or plutonium-239. The problem is that most nuclear reactors use uranium as a fuel and produce plutonium during operation.
- A major challenge to nuclear proliferation controls has been the spread of uranium enrichment technology to Iran, Libya and North Korea, aided by the Khan network established by Pakistani nuclear scientist Abdul Qaadeer Khan.
- It is impossible to adequately protect a large reprocessing plant to prevent the diversion of plutonium to nuclear weapons.
- A small-scale plutonium separation plant can be built in four to six months, so any country with an ordinary reactor can produce nuclear weapons relatively quickly.
- Restricting the production of fissile material to a few 'trusted' countries will not work. It will engender resentment and create a colossal security threat. A new UN agency is needed to tackle the twin threats of climate change and nuclear proliferation by phasing out nuclear power and promoting sustainable energy.

Introduction

Nuclear power and nuclear weapons are like Siamese twins – joined physically at birth and growing up together, pushing and pulling each other into shape. When the UK's Queen opened 'the world's first nuclear power station' at Calder Hall (at Sellafield) in 1956, its primary role was to produce plutonium for British bombs, clearly demonstrating the inextricable link between civil and military nuclear power. (1)

Since the Non-proliferation Treaty (NPT) came into force in 1970, Israel, India, Pakistan and North Korea have all obtained nuclear weapons and demonstrated the connection with civil nuclear power. Iran, Iraq and Libya have all confirmed the connection. Some have used uranium enriched to bomb-grade, others have separated weapons-useable plutonium from spent nuclear waste fuel, whilst some have done both. The technology has been spread around the globe, usually with, at least, the complicity of the nuclear weapons states.

International agreements create the illusion that nuclear proliferation can be controlled at the same time that nuclear power is promoted around the globe. But the only way to halt nuclear proliferation is by phasing out nuclear power and replacing it with cheaper, safer, less

polluting and sustainable ways of meeting our energy needs which promote world peace rather than threatening it.

The Atoms for Peace Myth

"The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose"

Article II of the Statute of the IAEA

Article IV of the NPT reaffirms the 'inalienable' right to develop the peaceful uses of nuclear technology, and pledges parties to facilitate trade with this in mind.

In December 1953, US President Eisenhower proposed, as part of his "Atoms for Peace" programme, the creation of the International Atomic Energy Agency (IAEA) to take custody of nuclear material, ensure its safe keeping, and use it for peaceful purposes. In 1957, the IAEA was set up to "accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world". The signing of the NPT followed in 1968.

But the IAEA and the NPT embody a fundamental contradiction – both seek to promote the development of 'peaceful' nuclear power whilst at the same time trying to stop the spread of nuclear weapons. Nuclear-weapon parties to the NPT (defined as states that had manufactured and detonated a nuclear device by January 1, 1967) – the US, Soviet Union, Britain, France and China – are prohibited from transferring nuclear weapons or associated technology to non-nuclear states, yet are obliged to provide technologies for civilian nuclear activities. In return the non-nuclear states agree not to seek weapons and to accept 'safeguards' on their civilian nuclear materials.

Even before the ink was dry on the NPT in l968, officials in the U.S. had privately warned their superiors that non-weapons member states could come within weeks of acquiring a nuclear arsenal by amassing nuclear weapons useable fuels claiming that these were intended for peaceful purposes. But this advice was quietly ignored. (2)

Fissile material

Manufacturing a nuclear bomb requires fissile material - either uranium-235 or plutonium-239. The problem is that most nuclear reactors use uranium as a fuel and produce plutonium during operation.

In natural uranium only around 0.7 per cent consists of the fissile uranium-235. The rest is uranium-238. This is too dilute to support a chain reaction, so most modern reactors require the proportion of uranium-235 in the fuel to be increased to around 2 or 3 per cent – a process known as enrichment. However, by increasing the proportion of uranium-235 to around 90 per cent, it is possible to make a nuclear bomb. So, basically anyone with uranium enrichment technology for manufacturing nuclear fuel can also manufacture a nuclear weapon. A nuclear bomb requires around 20 kilograms of Highly Enriched Uranium (HEU).

When a nuclear reactor is operating, uranium-238 in the fuel is transmuted into plutonium-239, so, provided the equipment is available to separate out this plutonium from the waste, anyone with a nuclear reactor can also make a nuclear bomb using plutonium. Plutonium separation is a chemical process carried out in what is known as a nuclear reprocessing plant. In a nuclear reactor, other plutonium isotopes will be produced as well. To make an efficient

and predictable nuclear weapon you would want to maximise the proportion of plutonium-239 produced. But any grade plutonium can also be used to make nuclear weapons, if you are not too worried about yield and efficiency, as has been noted by the US Department of Energy. (3)

It has been estimated that at the end of 2003 there were about 1,830 tonnes of plutonium in the world – enough for over 225,000 nuclear weapons. (4) To complicate matters, some countries have reprocessing plants to separate plutonium and unused uranium from nuclear waste, ostensibly so that the plutonium can be used as a fuel in nuclear reactors.

Proliferation – the uranium route

A major challenge to nuclear proliferation controls is the spread of uranium enrichment technology for enriching uranium in the isotope uranium-235. Nothing better illustrates how, so-called, peaceful nuclear technology can be used for military purposes than the activities of the Khan network. Abdul Qaadeer Khan was able to build a global nuclear information network and business which had access to supposedly secret uranium enrichment technology. Using a mixture of legal and illegal transactions involving businesses all over the world, ultracentrifuge enrichment technology was exported to Libya, North Korea and Iran. (5) Iran, for example, despite being a signatory to the NPT, established a uranium enrichment programme without informing the IAEA. So existing controls, legal arrangements and guidelines failed to stop the export of sensitive nuclear technology.

Proliferation – the plutonium route

Another major weakness of the IAEA system is the impossibility of adequately safeguarding a reprocessing plant used to remove plutonium from spent reactor fuel elements. (6) Commercial reprocessing plants are some of the most sensitive plants as far as the diversion of weapon-usable materials is concerned. They handle large amounts of plutonium that can be used to fabricate nuclear weapons – typically about 7 or 8 tonnes of plutonium a year. A nuclear weapon can be made with as little as 3 or 4 kilograms of reactor-grade plutonium. To ensure the timely detection of the diversion of such a small amount of plutonium in a plant where so much plutonium is handled requires much more precision than is achievable with today's technology, so the IAEA has an impossible task. The Agency claims that a commercial plutonium-reprocessing plant can be safeguarded with an effectiveness greater than about 99 per cent. This means that, even on the most optimistic assessments, at least 1 per cent of the plutonium throughput will be unaccounted for - about 70 or 80 kilograms per year, enough to produce about 25 nuclear weapons. (7)

"Proliferation Resistant" Reactors – a misconception

But separating plutonium from spent nuclear waste fuel does not require a large industrial-scale reprocessing facility. A quick and simply designed plutonium separation facility could be in operation four to six months after the start of construction. (8) It is often suggested that countries like North Korean or Iran should be offered help with civil nuclear reactors in exchange for abandoning nuclear weapons programmes. This idea is based on the fundamental misconception that conventional nuclear reactors are somehow proliferation resistant.

North Korea, for example, requested Light Water Reactors (LWRs) in return for abandoning its nuclear weapons programme. But these reactors can, in fact, be efficient producers of plutonium. The quality of the plutonium is largely dependent on the length of time the fuel is left in the reactor. If the fuel is taken out of the reactor after only a short period, the production of high quality plutonium can be maximised. But even if the reactors are operated in electricity producing mode, a weapon can be produced using reactor-grade plutonium

although it wouldn't be as efficient and predictable as a weapon made with weapons-grade plutonium. The project to supply North Korea with two LWRs was abandoned in November 2005, but if it had gone ahead it could have increased the quantity of weapons useable material available to the regime, rather than decreased it.

Opening Pandora's Box

Not every country with a nuclear weapons programme is a Party to the NPT. Israel, Pakistan and India are all known to possess nuclear weapons, but none is Party to the Treaty. All three have demonstrated the link between nuclear power and nuclear weapons. Yet, astonishingly, US President George Bush has recently agreed to help India with its nuclear energy programme, undermining the very principle upon which the treaty is supposed to be based – that assistance with the development of nuclear energy is available only to those who say they will eschew nuclear weapons. There is no doubt that condoning avoidance of the NPT encourages the spread of nuclear weaponry. Japan, Brazil, Indonesia, South Africa, Argentina and many other technologically advanced nations have chosen to abide by the NPT to gain access to foreign nuclear technology. If India can get help anyway, why bother agreeing to do without nuclear weapons? Former US President, Jimmy Carter, called the deal "*just one more step in opening a Pandora's box of nuclear proliferation*". (9)

Laying the foundation for weapons proliferation

The Director General of the IAEA, Mohammed ElBaradei has acknowledged that controlling access to nuclear weapons technology has grown increasingly difficult, and that there is nothing under the current non-proliferation regime to stop the spread of uranium enrichment or reprocessing technology and thus access to weapons-useable material. (10) He says not having plutonium and highly enriched uranium is the way to go. (11) Logically, therefore, we should introduce a comprehensive fissile material treaty, which bans all uranium enrichement and reprocessing facilities. Instead, ElBaradei, has called for the "internationalisation" of all fissile materials production – prohibiting any state from operating uranium enrichment and reprocessing facilities. (12) But States would still be supplied with nuclear materials for use in nuclear reactors laying the foundations for more proliferation. The IAEA's proposed Multilateral Nuclear Approaches (MNA) would, if realized, rather than solving some of the key problems of nuclear power, increase nuclear proliferation and radioactive contamination of the environment as well as multiply transports of plutonium, nuclear fuel and highly radioactive waste. (13)

An idea similar to the IAEA plan is being promoted by the United States, which favours a massive expansion of nuclear power across the developing world. The idea is to keep the more sensitive nuclear facilities that can be easily used to divert materials for making bombs within the G8 countries. Other countries would not be allowed to enrich uranium fuel, or to reprocess spent fuel to extract plutonium. They will be permitted to run reactors to generate electricity but will have to buy fuel enrichment and reprocessing services from G8 countries. (14) Controlling who can have access to what type of technology is not the way to prevent nuclear proliferation. Such a system would engender resentment and create a colossal security threat. (15) There is no basis, other than a "do as I say, not as I do" approach, for the West to say to others - the Iranians, for example - they cannot build the same nuclear facilities as us.

A plutonium economy

At the same time, as trying to tackle nuclear proliferation, nuclear energy is being promoted as a solution to climate change. But due to the fact that uranium supplies are limited, this is likely to mean more separation of weapons useable plutonium and shipments under armed guard around the globe.

According to the IAEA and the Organization for Economic Co-operation and Development (OECD) the total identified amount of conventional uranium stocks, which can be mined at a reasonable cost, is about 4.7 million tonnes, which is sufficient, at current demand, for 85 years. World uranium sources are probably much larger – up to 35 million tonnes - but the cost of extracting this would be prohibitive and the amount of energy required and the carbon released as a result would make it pointless. So it is likely that, if there is to be a global expansion of nuclear power, the industry will attempt to develop fast reactors, which can be fuelled with weapons-useable plutonium, and create more plutonium in the process. In theory this could lengthen the life of uranium resources to 2,500 years. (16)

This 'plutonium economy' would require more reprocessing and more transports of plutonium and mixed uranium and plutonium oxide (MOX) fuel around the globe. This will present a serious threat to efforts to control the spread of nuclear weapons and prevent nuclear terrorism. The United Nations Intergovernmental Panel on Climate Change (IPCC) said the security threat of trying to tackle climate change with a global fast reactor programme "would be colossal" (17) Even without fast reactors, all of the reactor-designs currently being promoted around the world could be fuelled by MOX from which plutonium can be easily separated.

Conclusions

The history of the IAEA and the NPT demonstrate that peaceful nuclear energy is a myth. Promoting 'peaceful' nuclear power has accelerated nuclear weapons proliferation. Nuclear reactors in India, Pakistan, Israel, and North Korea (DPRK) have produced nuclear materials, which have been used to make nuclear weapons. Restricting the spread of nuclear material whilst at the same time promoting nuclear power does not work. The IAEA's 'finger in the dyke' approach is simply not a sustainable and comprehensive solution.

The United Nations needs a body which can lead the way in tackling the twin threats of climate change and nuclear proliferation by stating clearly that we need to phase out nuclear power and replace it with cheaper, safer, less polluting and sustainable ways to meet our energy needs which promote world peace rather than threatening it. (18)

A Short Chronology of Nuclear Proliferation

May 1967 On the eve of the Six Day War Israel hurriedly produces two crude but deliverable nuclear weapons. (19) The Dimona nuclear reactor from which Israeli nuclear weapons material were derived was built with help from France (20)
1968 Having lost its uranium supply from France, Israel is suspected of executing Operation Plumbat, which secretly secures 200 tons of uranium oxide. (21)
18th July 1970 The New York Times says the US Government believes Israel to be in possession of nuclear weapons.
1974 The CIA estimate that Israel has between ten and twenty nuclear weapons. The estimate is based on the assumption that it has been able to separate enough plutonium for at least six bombs since 1970, in addition to those made with stolen uranium.
May 1974 India exploded a nuclear device. Plutonium from India's Canadian-built reactor was reprocessed and used to make a nuclear bomb. (22)
July 1977 Preparations for a South African nuclear test were detected in the Kalahari Desert. (23). The test, was possibly arranged with Israeli help, but is prevented by the intervention of the US and USSR. (24)
22nd September 1979 A US satellite detected a low yield nuclear explosion off the coast of South Africa. The bomb was made with enriched uranium. South Africa developed enrichment technology with help from Germany. It is thought to have been a joint Israeli – South African test.

7th June 1981 Israeli planes bomb Iraq's Osirak reactor outside Baghdad. Israel alleges that Iraq is using Osirak to manufacture nuclear weapons, despite having signed the NPT. (25)
5th October 1986 Mordechai Vanunu, an ex-technician at the Dimona reactor, reveals his knowledge of Israel's nuclear weapons program. Later Vanunu is kidnapped by Israeli agents, tried, and imprisoned. (26)
1987 West Germany refuses to finish building the Bushehr nuclear power plant, which Iran has already paid for, after pressure from the United States. Iran is an NPT signatory, but US officials say there are "solid nonproliferation grounds" for not completing the reactors. (27)
Early 1989 US satellite imagery detects the construction of a nuclear research centre in North Korea which includes a reprocessing facility in Y_ngby_n-kun. North Korea is also alleged to have produced weapons grade uranium. (28)
1994 North Korea agrees to freeze its nuclear programme, and stop operating a 5MW plutonium-producing reactor and the construction of two further reactors capable of producing plutonium. In exchange two Light Water Reactors (LWR) will be built by a US-led consortium known as the Korean Energy Development Organization (KEDO). (29)
May 1998 On the 11th and 13th May India conducted nuclear test explosions, and Pakistan detonated nuclear devices of their own on the 28th and 30th May. (30)
December 2001 A television documentary made by Israel's leading documentary team reveals how France was complicit in developing Israel's nuclear weapons program. (31)
2002 Undeclared uranium enrichment facilities at Natanz in Iran are revealed. (32)
16th October 2002 It is revealed that North Korea is pursuing a uranium enrichment programme with nuclear weapons capability the ultimate goal. (33)
10th January 2003 North Korea announced its intent to become the first country ever to withdraw from the NPT. (34)
6th June 2003 The IAEA claims that Iran has not met its obligations to "account for nuclear material, report on its processing and use, and to declare facilities where the material is stored and processed." (35)
26th August 2003 IAEA Inspectors find traces of highly enriched uranium (HEU) at Natanz. Iranian officials claim the traces came from equipment imported from "another country".
25th September 2003 IAEA Inspectors find traces of HEU at a second site in Iran.
October 2003 A German cargo ship is intercepted on its way to Tripoli and brought to an Italian port, where uranium centrifuge components are confiscated. The parts were made in Malaysia and shipped through the Middle East. The subsequent investigation by the IAEA resulted in a decision by Gaddafi to dismantle Libya's illegal nuclear program. (36)
9th November 2003 The IAEA releases a report revealing Iran's admission that it had produced a small amount of plutonium and conducted tests on uranium hexafluoride, in addition to having established a uranium enrichment plant, all of which it had earlier denied. The report says that "given Iran's past pattern of concealment, it will take some time before the agency is able to conclude that Iran's nuclear program is exclusively for peaceful purposes." The following day Iran calls a temporary halt to uranium enrichment.
12th November 2003 The IAEA says there is no evidence of a secret weapons program in Iran but expresses concern regarding production of plutonium. (37)
2004 The world learns that Pakistani scientist Abdul Qadeer Khan has provided nuclear-weapons-related technology to a number of countries, including North Korea, Iran, and Libya.
July 2005 US agrees to civil nuclear co-operation with India in return for some safeguards at India's civil nuclear facilities.
3rd August 2005 Documents from the British National Archive reveal that Britain sold heavy water [necessary for the production of plutonium] to Israel in 1959 and 1960, providing a substantial push for the Israeli nuclear program at Dimona. In March 2006 it emerges that Britain also supplied Israel with a number of other vital materials during the 1950s and 1960s.
March 2006 Iran decides to resume uranium enrichment.

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