A CND briefing by Davida Higgin, April 2006

The links between nuclear power and nuclear weapons

The links between nuclear power and nuclear weapons go back to the very beginning of the development of atomic energy. Over time the nature and strength of these links have varied.

Key points

- Any country that has nuclear power has the potential to make nuclear weapons.
- The Nuclear Non-Proliferation Treaty (NPT) enshrines the right of member states to have nuclear power as long as they promise not to develop nuclear weapons.
- The United Nations International Atomic Energy Agency (IAEA) promotes the spread of nuclear technology as part of its remit, as well as trying to ensure that civil nuclear material is not used for military purposes. Both the NPT and the IAEA, who are responsible for controlling nuclear proliferation, also have a brief to spread the use of nuclear power.
- The inspection and safeguarding roles of the IAEA are somewhat limited, in the official nuclear weapons-states as well as in others. Accounting for fissile materials is very problematic - Russia being a case in point, but not a lone case.
- The U.K. is a leading exporter of nuclear technology (for example, in the field of uranium enrichment).
- The U.K. could contribute significantly to world safety and security by not building more nuclear power stations, by working to create a Fissile Material Control Treaty, and by phasing out its nuclear exports.

Nuclear materials and weapons

Plutonium and uranium

Uranium ore contains only about 0.7% of the fissile isotope U235. In order to be suitable for use as a nuclear fuel for generating electricity it must be processed (by separation) to contain about 3% of U235 (this form is called Low Enriched Uranium - LEU). Weapons grade uranium has to be enriched to 90% of U235 (Highly Enriched Uranium or HEU), which can be done using the same enrichment equipment. There are about 38 working enrichment facilities in 16 countries. (1)

The Hiroshima bomb was made using about 60kg. of (HEU). Today's more sophisticated nuclear weapons can be made with 20 - 25 kg. because the numbers of warheads and their accuracy have been increased.

Plutonium is a product of the chain reaction in nuclear reactors; it is separated by reprocessing the "spent" fuel (which is highly radioactive but no longer usable in the reactors in fuel rods). In 2000 Britain had an estimated stockpile of some 78 tonnes of civil plutonium out of a world store of about 210 tonnes. (2). The military stockpile was about 7.6 tonnes in 1999 (3). Only 2 -10 kg. are necessary to make a nuclear bomb.

Depleted uranium
An important product of the processing of uranium which has commercial and military use is depleted uranium (DU) which is essentially what is left over after uranium enrichment. Some DU is used to make a tank armour-piercing projectile, the DU penetrator, which has been used in both Gulf Wars and in Kosovo. (Probably two or three times as much was used in the recent Gulf War as in the first.) DU is toxic both chemically and radiologically, and is widely believed, with scientific support, to have caused cancers, birth defects and deaths where used.

The Ministry of Defence admitted in 1998 "the potential to cause adverse health effects", but maintained: "There are no immediate plans to withdraw DU-based tank ammunition from service... No satisfactory alternative currently exists to achieve the levels of penetration required..." (4)

International aspects

The U.K.'s part in international proliferation of nuclear technology and materials
The export of nuclear technology and materials around the world, in which Britain is a leading player, involves problems, not least the increase of potential weapons creation. "In Britain, as elsewhere, the struggles of the civil nuclear industry have been translated into a compulsive drive to export civil nuclear services and technology to virtually all takers." (5) British examples include supplying uranium enrichment equipment to many overseas customers through its partnership with The Netherlands and Germany in the enrichment organisation URENCO, and reprocessing spent fuel from Japan, Germany and other countries. Reprocessing from abroad involves sending the resulting plutonium back to the source countries.

International control mechanisms
The International Atomic Energy Agency (IAEA) was set up under the UN in 1957 in the post-war enthusiasm for peaceful uses for atomic energy. Its remit was threefold: a) nuclear verification and safeguards, b) safety and security of nuclear material, and c) promoting science and technology (mainly nuclear). The IAEA's safeguards and safety roles involve inspection of nuclear sites in over 140 countries, mostly non-nuclear weapons-states. It is the verification authority for the NPT, because the main object of inspections is to ensure that civil nuclear material is safely stored and not used for military purposes.

The Nuclear Non-Proliferation Treaty (in force since 1970), like many treaties and agreements, was the result of some hard bargaining. States which agreed to continue as, or to become, non-nuclear weapons-states, did so on two main conditions: a) that the nuclear weapons-states would pledge to pursue "negotiations in good faith on effective measures relating to nuclear disarmament" (Article VI of the treaty), and b) that the non-nuclear weapons-states would have the "inalienable right" to develop nuclear energy for peaceful purposes (Article IV). Iran made a strong defence of its rights under Article IV at the recent NPT Review Conference (May 2005), and continues to do so.

At the heart of both the IAEA and the NPT lies a glaring contradiction, probably due to the complacent belief of the five original nuclear powers (who are of course also the five permanent members of the Security Council) that they could keep forever their monopoly of nuclear weapons. Israel, India, Pakistan and (probably) North Korea have broken that monopoly. To prevent being bound by the NPT they have simply not signed it, or in the case of North Korea, have left it. Any country with weapons ambitions could do the same.
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A proposed treaty banning the production of fissile materials has been under discussion for many years at the UN Conference of Disarmament in Geneva, but has never made much headway, largely due to U.S. objections.

Keeping track

Transfers between civil and military stockpiles are virtually impossible to track. Although the IAEA is charged with investigating this, their powers are in practice limited. The U.K. government, for example, has admitted that its agreement to inspections "was not intended to provide an assurance ... that material from the civil nuclear programme would not be used for defence purposes". (6)

Under the safeguards agreement, Britain could at any time withdraw any nuclear materials from safeguards "for national security reasons" (7) Plainly "...although the British government have repeatedly insisted that they have no current plans to divert civil material to military uses, they could at any point in the future change their mind - and there would be no IAEA safeguards to stop them." (8)

Even in countries (like the U.S., Britain and France) where safe and secure storage is a high and achievable priority, there are unaccountable discrepancies of plutonium. In Russia, since the break up of the Soviet Union, there are all too well-known problems of permeable storage, poor management, theft and smuggling, and Russia is not alone in this. It has been suggested that all plutonium, including military, should be put under the supervision of the IAEA, but all that has actually been done is that the civil material of some 140 (mainly non-weapons-states) is inspected.

Brief account of U.K. nuclear power development

The Maud Committee on the uranium bomb was formally constituted in 1940, under the Ministry of Aircraft Production; its task was to monitor and support British work on nuclear energy. Its report (1941) was in two parts: the first was on the use of uranium for a bomb, the second, much shorter, on the use of the fission process "to provide a machine which will release its energy in the form of heat, in a continuous manner". Such a machine "promises to have considerable possibilities for peacetime development but we do not think it will be of great value in this war." In a note to the Report it was recognised that "There must always be a very close relation between exploitation of nuclear energy for military explosive purposes and for power production in peace and war." It was also recognised that it was essential to develop the "uranium boiler" (as it was quaintly called), in the U.K. (Other countries were known to be studying the problem.) The Report also mentioned that the plutonium produced in the boiler might prove useful for a bomb. (9) Thus the two types of nuclear bomb (uranium- and plutonium- based), and a source of plutonium (which does not occur in nature) were prefigured already in 1941. The Hiroshima bomb was uranium-based, the Nagasaki one based on plutonium.

The passage of the McMahon Act by the U.S. Congress in 1946 ended the wartime collaboration on nuclear energy between the U.S. and Britain, later to be resumed under the
Mutual Defence Agreement of 1958. British development proceeded independently for some time, and centred mainly on a plutonium bomb.

The U.K.'s nuclear reactors as generators of military fissile material
The first electricity-generating reactors, at Calder Hall and Chapelcross, which became operational in the 1950s, were specifically designed to produce plutonium for military purposes, to augment the plutonium piles at Windscale (which were later destroyed in the Windscale fire of 1957). Electricity was a sideline. The first commercial generators, the nine Magnox stations, which became operational during the 1960s, were similar in design to Calder Hall and were also intended partly as a source of military plutonium, after reprocessing at Sellafield.

Other factors important to nuclear development
Although is would not be true to say that military needs have been the only reason for the development of nuclear power, this was certainly true to begin with. It remains an important factor, though others have entered in: the Suez and OPEC crises (1956 and 1973) made nuclear power an attractive alternative to unreliable or costly oil supplies, an argument that is being revived today, with gas being thrown into the mix. Also, in Britain in the 1940s there were coal shortages. Promising commercial considerations have played a part, especially where (as in Britain) the industry has been so heavily subsidised. However, the development of renewable technologies, energy efficiency and conservation have changed this picture to a very great extent. The intractable (so far) problem of nuclear waste, the fearful catalogue of accidents (of which Three Mile Island and Chernobyl are only the worst), concerns about radioactive leakages from power stations and the true costs of nuclear electricity have led to a very different standing for civil nuclear energy today.

Conclusion
By not replacing any of its nuclear reactors as they reach the end of their working life, thus slowing down and eventually stopping the production of more plutonium and uranium, Britain would have a first-rate opportunity to contribute to the safety and security of the planet. Perhaps it would inspire other countries to follow suit, given the many disadvantages of nuclear power. To maximise this contribution, we should also put our existing nuclear stockpiles under effective international control, help to devise a verifiable and universal Fissile Materials Treaty, and stop spreading nuclear technology around the world. We could spread our decommissioning skills, renewable and energy conservation technologies instead!

List of references

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(6) Parliamentary written answer to Trevor Skeet MP, 9.3.83, Hansard cols. 402-03, quoted in *"The Plutonium Connection*", Rob Edwards, CND Sizewell Working Group 1983, p.23

(7) *"The Plutonium Connection*", op.cit. p. 24

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