# PLOUGHSHARES INTO SWORDS: NUCLEAR POWER AND NUCLEAR WEAPONS By Dr Jeremy Adler\*

Are atoms for peace and atoms for war so interlinked as to be indistinguishable? This article initially considers this from a British perspective and then touches on the role of nuclear power in the spread of nuclear weapons. The underlying question is would a nuclear electricity generating industry exist without the arms programme. This can be reformulated as "is there an economic case for civil nuclear power or has its growth followed military and policital expediency?"

### HISTORICAL DEVELOPMENT

In 1956 the Queen opened the first Magnox nuclear power reactors at Calder Hall. This was hailed as a British triumph, the first nuclear power station and was further acclaimed as the epitomy of the peaceful atom. A rapturous press reported the dawning of a new age of clean safe power and of electricity "to cheap to meter". The atom bomb was declared to have been tamed.

In retrospect 1956 appears as a triumph of euphoria rather than technology. The Calder Hall station was not the first power generating plant, by 1954 a plant was already operating at Obninsk in the Soviet Union. Cheap electricity never arrived and the reactors are more accurately described as "gas cooled weapons reactors that made electricity on the side". Nonetheless the Magnox reactors were the basis of the first UK nuclear power programme. The initial design was scaled up and 9 stations were completed between 1961 and 1971, for the generating boards, they are still in operation.

The second generation of power reactors, the advanced gas cooled reactors (AGRs), were expected to generate power more cheaply than contemporary fossil fuel plants, by operating at a higher temperature and through the use of enriched fuel (2-4%). The use of enriched uranium necessitated the expansion of the enrichment facility at

Capenhurst.

The AGR programme is widely regarded as a disaster. Arthur Hawkins, a former head of the CEGB, said of the venture "it is a catastrophy we should not repeat" whilst Prof Henderson, of University College London, described the venture as "one of the three worst civil investments in the history of mankind" the other two were Concorde and its Soviet counterpart. The first AGR, Dungeness B, was expected to take eight years to complete, instead twenty years elapsed before any electricity was fed into the grid. Unchastened the generating boards still maintained that electricity from the nuclear programme was cheap. However the Common's Select Committee on Energy. 1980-81, were highly critical of the accounting procedures underlying this assertion, stating, in paragraph 61 of their report, that "the resultant figures are highly misleading as a guide to past investments and entirely useless for appraising future ones". The procedure under attack was historic cost accounting, this understates the importance of capital costs whilst emphasising current (running) costs. For nuclear advocates this is highly advantageous given the enormous capital but low operating cost of nuclear power plants.

From a commercial standpoint the British nuclear industry has failed, it has never delivered the cheap energy so glibly promised, always remaining a tantalising few years away, its export record is pitiful, only two overseas sales; small Magnox reactors one to Japan and one to Italy. In addition the programme involved the expansion of the reprocessing plant at Windscale (now known as Sellafield). The operation of this facility has seriously contaminated the coastline of Northern Britain and increased the incidence of radiation related cancers. A reprocessing plant is used to recycle spent reactor fuel rods and in so doing produces high level radioactive waste and plutonium. At present a new facility is planned for Windscale, intended to reprocess AGR fuel which has so far been kept in store. Once the new facility is operational it will be used to reprocess foreign enriched fuel. Discharges into the Irish Sea will undoubtedly increase.

### THE MISUSE OF "CIVIL" PLUTONIUM

Reprocessing includes extraction of plutonium and as no records are made available to the public the diversion of notionally civil plutonium to the military programme would be a simple matter. Hence pilfering of plutonium for the military is possible but relatively unimportant when compared with the use made of the civil plutonium stockpile. In the late fifties the US and the UK made arrangements for the exchange of fissile material and technology, this required the amendment of the McMahon act. British plutonium, four tons from the civil and an unknown amount from the military stockpile, crossed the Atlantic between 1964 and 1971. In return highly enriched uranium, tritium and information came east. The tritium was for the hydrogen bomb and the highly enriched uranium for fuelling British hunter killer and later polaris sumbarines, possibly it was also used more directly in the weapons programme. The Magnox reactors were unusable for submarine propulsion but the American navy had developed the PWR (pressurised water reactor) for submarines. To operate nuclear powered submarines the Royal Navy needed the American technology and additional plutonium was required by the States for its burgeoning weapons programme. Thus even without considering the use made of UK civil plutonium by the Americans it is readily apparent that the UK weapons programme benefited enormously from civil nuclear power.

The civil programme also benefits the military by blurring the distinction between civil and military. Windscale is vital to the military but not essential for a civil programme. The Dounreay complex, operated by the UKAEA, has HMS Vulcan attached. Vulcan is the testing site for submarine PWRs.

Non military considerations are also behind the support provided to the uneconomic civil nuclear industry. A leaked cabinet document, dated October 1979, stated that an expanded civil nuclear industry had the major advantage

## NO COMMENT:-

The following advert appeared in the Glasgow 'Evening Times' of Tuesday, May 22, 1984.

"MINERS. Your redundancy pay can be invested in a profitable guest house or business. Professional advice offered without obligation. We have 35 years of experience and our founder is a miner's son—he knows how worried you are. Come and see us. Kays Estate Agents, 225/229 Church Street, Blackpool, Lancs. (0253) 23486."

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### **NUCLEAR MATERIAL**

Some atoms are inherently unstable and spontaneously split which releases energy. A few elements can sustain a chain reaction, one atom splitting causes further atoms to disintegrate which in turn lead to the splitting of yet more atoms. In a bomb this process proceeds without restraint and vast quantities of energy are released in an instant. When restrained the energy released by splitting (called fission) is used as a heat source in the generation of steam which then drives a turbine and hence generates electricity.

The important elements are uranium and plutonium. Uranium occurs naturally in two forms of differing weight, uranium 235 and uranium 238. Only uranium 235 is able to support a chain reaction. This form comprises 0.7% of the naturally

occurring element.

Plutonium is a man made element, formed from uranium 238 in a nuclear reactor. When uranium 235 undergoes fission neutrons are ejected which can convert non fissile uranium 238 into fissile plutonium.

Nuclear reactors use natural or slightly enriched (2-4%) uranium 235 as fuel. Atomic weapons require very highly enriched (90%) uranium or plutonium to confuse the issue, material enriched to 20% is referred to as weapons grade, for proliferation purposes. Because is it easier to further enrich 20% uranium than to enrich natural uranium (0.7% uranium 235).

Weapons grade material is also employed as fuel for nuclear powered submarines, further complicating control.

The other material of great importance is tritium which is required for the hydrogen bomb.

of removing a substantial portion of electricity production from the dangers of disruption by coal miners or transport workers. A position entirely consistent with the Government's current attack on the mining industry.

#### THE SPREAD OF NUCLEAR WEAPONS

Internationally nuclear power programmes are used to circumvent the 1968 Non Proliferation Treaty. The NPT attempted to stop the number of nuclear weapons states increasing. Non weapon holding signatories foreswore the weapons option in return for assistance with nuclear research, fissile material, help in their civil programmes and a commitment on the part of the weapon holding signatories to work towards the abolition of nuclear weapons.

However despite the NPT the number of countries believed to hold or to be about to obtain nuclear weapons has increased. The NPT fails because of the overlap between civil and military nuclear technology. All reactors generate plutonium, the major hurdles are enrichment

and reprocessing. These plants can be built within the terms of the NPT if the declared role is peaceful. This includes the development of submarines fuel (Argentina) and assertions that the highly enriched plutonium is for a breeder reactor. The breeder reactor uses plutonium as fuel but generates more plutonium from uranium 238 and is seen as the solution to any future uranium shortages. A weapons route outside the terms of the NPT involves simply taking advantage of the dissemination of nuclear technology following from the provisions of the NPT and constructing your weapons covertly (Iraq, S Africa, Israel). A blatant approach, arguably, within the provisions of the NPT is that adopted by India, explode a nuclear device and swear it's peaceful.

In conclusion civil nuclear programmes have been used as paths to nuclear weapons by non weapon states and used by weapon holding states to underpin their weapons programme. In the UK and internationally nuclear power has not proved economic but is still underwritten by governments. After three decades nuclear power only accounts for 1% of the total energy used by mankind.