

NUCLEAR POWER

A Briefing from Friends of the Earth

Sustainable development is about leaving the planet in a reasonable state for future generations. Nuclear power is the ultimate unsustainable form of energy generation, creating wastes which will be dangerous for thousands of years. After all, if the Romans had had nuclear power we would still be guarding their waste.

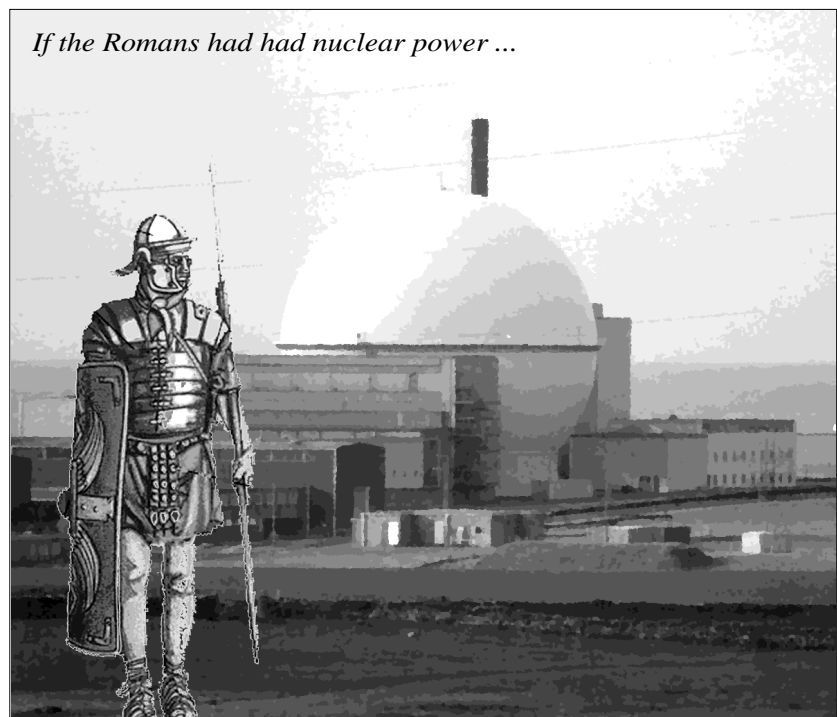
The nuclear industry is trying to promote itself as the answer to climate change. Yet, at the recent Climate Conference in the Hague, even the United States had given up supporting nuclear power. If Scotland were to build another nuclear station the costs would mean we would not invest in renewables, we would lose our world lead in wave power technology and we would leave even more nuclear waste for future generations to deal with. The real answer is to make Scotland more energy efficient - at home, at work and in transport - and to exploit the tremendous potential of renewable energy sources like the wind, waves and energy crops.

Nuclear power should have no role in Scotland's sustainable energy future beyond the life of the current stations.

What contribution does nuclear power make now ?

British Energy plc currently has 4 Advanced Gas Cooled (AGR) reactors running at Hunterston 'B' in Ayrshire and Torness in East Lothian. Together these reactors generate a little over half of Scotland's electricity, with Scottish Power and Scottish and Southern Energy obliged to buy every kilowatt they produce and pay a guaranteed price. Some of this electricity is then exported to England. Hunterston is due to shut around 2011 and Torness around 2025.

In addition a set of 4 small Magnox reactors, designed mainly to produce plutonium for nuclear weapons, are operated by British Nuclear Fuels Ltd (BNFL) at Chapelcross in Dumfries and Galloway. BNFL also own the two closed Magnox reactors at Hunterston 'A'. Reprocessing operations at Dounreay in Caithness are suspended and the site is to be returned to a greenfield state (apart from the bits will be radioactive for hundreds of years) over the next 60 years at a cost of at least £4bn.



Who says we need a new nuclear power plant ?

The Sunday Herald newspaper (5/12/00) claims that **Scottish Executive civil servants** are calling for a “rational debate” about nuclear power, with some senior officials supposedly strongly in favour of one or more new nuclear power stations for Scotland.

Officials at the **DTI** are still keen to privatise British Nuclear Fuels Ltd and are considering a new generation of stations to replace the old Magnox ones. **BNFL's** chairman recent stated their aim to get the go ahead for new plants within the next 5 years, stating that it had "got the technology and the ... sites ... already connected to the national grid."

British Energy, the operators of Torness and Hunterston, have said they would only build more nuclear stations if it “enhances shareholder value” (Herald 8/12/00) and have also stated "It takes ten years to plan and build a new power station but there are no specific plans at the moment" (Edinburgh Evening News, 9/12/2000).

The **Conservative Party** have traditionally supported nuclear power with recent calls to build up to 8 new Pressurised Water Reactor in the UK.

A number of respondent to the recent consultation on climate change mentioned nuclear power. The only organisation which firmly suggested keeping the nuclear option open was **CBI Scotland**. The Scottish Whisky Association and the Environmental Working Group of the Scottish Utilities Forum bemoaned the exclusions of nuclear power from climate change levy exemptions.

Who is against new nuclear power plants ?

The **Scottish Executive's** climate change strategy, produced in November 2000, assumes that nuclear power will be being phased out over the next 10 years. It states: “it is much too early to be certain how nuclear capacity would be replaced when it begins to close (in perhaps 10 years time or more), or with what type of generation source.” The **DETR** does not mention nuclear power specifically in the UK strategy but mentions energy from “sustainable sources.”

Within the responses to the recent consultation on climate change there was widespread support for the development of Scotland's renewable energy resource, with a number of organisations calling for a review of the role of nuclear power, and a number explicitly against further expansion of nuclear capacity. Those who thought that a proper assessment of the future of nuclear power was needed include **Scottish and Southern Energy, Fife Council** and **COSLA**.

Those opposed to nuclear power included **Fife Council** (“... not ... in favour of the creation of any new nuclear power stations in Scotland or the UK”), the **Woodland Trust Scotland** (“decommissioning of nuclear power stations provides a valuable opportunity to substitute that form of power generation with renewable energy generation ... we urge the Executive to ensure that nuclear power stations are replaced with renewable energy generation as they are decommissioned”), **WWF** (“... targets for developing renewables beyond 2010 are also needed to offset the rundown of the unsustainable nuclear component of Scotland's energy mix”) and **Friends of the Earth Scotland**.

It has been suggested that the **Scottish Environment Protection Agency (SEPA)** are in favour of new nuclear power but their submission to the consultation sounds a clear caution: “the case for further provision of nuclear capacity is not straightforward, particularly if a rigorous environmental analysis is applied to the resource utilisation and embedded energy required to construct a nuclear power plant to the safety standards

necessary for safe operation. The most serious issue as far as SEPA is concerned, as the regulator for nuclear waste disposal, is the need for a clear policy on the future management and disposal of spent nuclear fuel. Until this is resolved it would be imprudent to encourage the further development of new nuclear generation facilities.“

Similarly a UK **Parliamentary Select Committee** reported in March last year the UK should set a challenging target for renewable energy but that: “it can also be argued that the high costs and unresolved waste issues should rule out the option of building new nuclear capacity.“

Amongst the political parties, the **SNP** and the **Scottish Green Party** have always opposed nuclear power. In their environment policy document ‘In Trust for Tomorrow’ in 1994 **Labour** said “we will not build any new nuclear power stations” and in the 1997 election manifesto they said “we see no economic case for the building of any new nuclear power stations.” The **Liberal-Democrats** 1997 Manifesto says “nuclear stations will not be replaced at the end of their design life.”

John Home Robertson, Labour MSP for East Lothian, recently proposed a motion supporting nuclear power in the Scottish Parliament but even he says "any debate on the subject of nuclear energy has to be tied to the decision on the disposal of waste. Until that is dealt with it is not realistic to think about building new nuclear power stations" (Herald, 8/12/2000). Similarly, **David Munn**, North Ayrshire councillor and member of the Hunterston liaison committee, said he opposed any plans for a new nuclear station in Ayrshire "until the problem of the safe disposal waste is sorted."

Members of **Scottish Environment LINK**, the umbrella body for environment, conservation and heritage groups, recently signed up to a Climate Action plan, including the statement that “renewable energy sources, like energy from the wind, waves, sun and specially grown 'energy crops,' are essential if we are to use less fossil fuels and phase out nuclear power. Investment in renewables is investment in clean energy, jobs in Scotland and new manufacturing industries.”

The **Royal Commission on Environmental Pollution** stated last year that before nuclear power could become part of the solution, “nuclear waste will first have to be dealt with to the satisfaction of the scientific community and the general public. People are unlikely to accept new nuclear power stations unless they are part of a strategy that also delivers radical improvements in energy efficiency and an equal opportunity for deploying renewable energy sources that can compete in terms of costs and reduced environmental impacts.”

At the recent UN Climate Conference in the Hague even the United States, long time promoters of nuclear power, had gone off the idea, and allowed nuclear power to be excluded from proposals for developing countries.

What’s wrong with nuclear power ?

When a nuclear reactor uses nuclear fission to produce heat and electricity virtually no CO₂ is emitted. However the mining and fabrication of nuclear fuel and the construction of stations do use considerable amounts of fossil fuels.

In large doses radiation can cause death by radiation sickness. At lower doses it causes a range of problems such as cancer or genetic damage. In normal use, all nuclear stations have routine emissions of radioactivity to air and water, and since there is no safe level of radiation all nuclear power stations are adding to the health burden of the local population. More severe problems are likely to be caused by nuclear accidents. In the following

sections the many ways in which nuclear power can release radiation are considered. These include accidents, discharges, uranium mining, nuclear waste, proliferation and terrorist threat.

Accidents - over its forty year history, accidents and breaches of safety culture have become just another part of the routine of the nuclear industry (see box). As a result an inevitable part of nuclear power is the risk of a catastrophic release of radiation.

Discharges - apart from the risk of accidental release of radiation, nuclear power stations release radiation deliberately into the skies and surrounding waters routinely. This is despite the fact that there is no safe level at which radiation will not damage DNA and initiate cancer. Thus despite the fact that it is known that no safe level of radiation exists, nuclear power stations continue to routinely discharge radiation into the environment. Elaborate measures are now called for to cut nuclear discharges with the UK signing up to the OSPAR Convention's decision to cut maritime radioactive discharges to close to zero.

Uranium Mining - in addition to the routine discharges from nuclear operation radiation exposure is caused by mining the uranium used to make the fuel for the nuclear reactors. Uranium miners - such as those in Canada, the USA, Namibia and Sweden - breathe radon, derived from uranium, and which can cause lung cancer. One study suggests that each year 44 uranium miners receive fatal doses of radiation.

Nuclear Waste - nuclear power produces long-lived radioactive wastes for which no disposal route has been found. Back in 1976 the Royal Commission on Environmental Pollution stated: "we must assume that these wastes will remain dangerous and will need to be isolated from the biosphere for hundreds of thousands of years. In considering arrangements for dealing safely with such wastes man is faced with timescales that transcend his [sic] experience." Despite having had over forty years to deal with the problem created, no repository for high level wastes has been established anywhere in the world. Forty years' research has only demonstrated the failure of the idea that nuclear waste can be "disposed of" underground, without leaking back into the environment and threatening the health of future generations. In 1997 the UK Government rejected the nuclear industry's plan to begin building a nuclear dump because of the appalling science that was put forward to support the plan.

Proliferation and Nuclear Terrorism - plutonium is made in nuclear reactors. Some countries such as France and the UK separate it so that it is readily available as the raw material for nuclear bombs. Monitoring the stocks of plutonium both in the spent fuel and in the raw form is difficult and the International Atomic Energy Agency lack confidence in their own system. They have commented: "The IAEA's verification system cannot physically prevent diversion of nuclear materials or the setting up of any undeclared or clandestine nuclear weapons programme." Some years ago New Scientist magazine carried details of how to make a simple nuclear bomb the size of a large suitcase.

In 1976 the Royal Commission on Environmental Pollution concluded on plutonium that: "we should not rely for energy supply on a process that produces such a hazardous substance as plutonium unless there is no reasonable alternative."

International reports of a terrorist threat aimed at an Australian nuclear research reactor and to coincide with the Sydney Olympics indicate that we cannot let down our guard on nuclear power.

Major nuclear accidents and breaches of safety culture

Windscale, UK 1957 - the Windscale No 1 Pile was one of two military reactors built on what is now the BNFL site at Sellafield in Cumbria. It was used for the production of plutonium for the nuclear weapons programme. In October 1957 during a routine release of energy the reactor overheated and caught fire. Some of the intensely radioactive smoke from the fire was released and spread over England, Wales and northern Europe. It took two days and five million litres of water to put the fire out. After the accident 2 million litres of milk were thrown away because of the threat posed by radioactive iodine that it was contaminated with. Despite this effort the predicted cancer deaths because of the accident are 100. These deaths are predicted to occur over 40 years. At the time the seriousness of the accident was played down, and it was only much later that the truth emerged.

Chelyabinsk-40, Russia 1957/1958 - this accident contaminated thousands of square miles in the Central Ural Mountains of Russia and may have caused hundreds of human casualties. However news of the accident was suppressed for many years. Lakes, soils and more than 200 animal and plant species in an area covering several thousand square miles had been contaminated by radiation. The exact cause of the accident is unknown.

Three Mile Island, USA 1979 - a serious accident occurred on March 28th 1979 at Three Mile Island 15 km from the town of Harrisburg (population 60,000) and 240 km from New York. The nuclear reactor core overheated and partially melted. In the immediate aftermath of the accident experts could not agree on the possibility of an explosion which would breach the containment vessel. Finally 3,500 children and pregnant women were evacuated and 400,000 people left of their own accord. Luckily the reactor containment was not breached. This accident - which was caused by an initial failure in a pump compounded by human error - released much more radioactivity than the Windscale accident, but because it was mostly in the form of inert gases, the effect on human health will be much smaller.

Chernobyl, Ukraine 1986 - on April 26th 1986 operators lost control of Chernobyl Unit Four reactor after they had been carrying out improper experiments. Within four seconds the reactor reached 100 times normal power. This caused a steam explosion which blasted apart its 1000 tonne lid. There was a second hydrogen explosion hurling radioactivity a mile into the sky. More than thirty fires were started by the flaming reactor debris and the graphite core of the reactor was alight. Three to four per cent of the radioactive content of the core was lost, and 31 people were killed directly trying to minimise the escape - 29 due to radiation sickness. According to a Soviet estimate half of Chernobyl's fallout fell within 35 km of the reactor. One hundred and thirty five thousand people were evacuated from a 30 km diameter zone centred on the reactor. The other half of the fallout fell on more than twenty countries world-wide stretching as far as North America - resulting in limitations on food. The US DOE - a pro nuclear body who would be expected to give estimates at the lower end of the range - calculated that world-wide there would be around 40,000 deaths from Chernobyl induced cancers. The World Health Organisation recently predicted 50,000 extra thyroid cancers. This figure does not include the other health effects such as non-fatal cancer, brain damage or genetic abnormality. Today, 15 years after the Chernobyl disaster, the movement and sale of 34,500 sheep is still restricted on 18 Scottish farms, with some restrictions expected to continue for another 15 years.

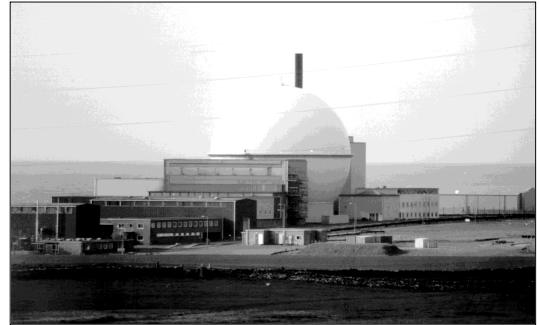


Tokai Mura, Japan 1999 - on September 30th 1999 three workers involved in a fuel fabrication process breached the proper procedures resulting in what is known as a nuclear 'criticality' that exposed these workers to serious levels of radiation. Two of the workers received such high doses that they died. Over 400 others were exposed. Workers used an unapproved version of the operational manual that had not been shown to the regulator because it was known it would not be accepted. Even these unsatisfactory rules were themselves flouted.

BNFL, UK 2000 - on February 18th 2000 the UK nuclear regulator reported that BNFL had repeatedly falsified key safety data on fuel that they manufactured. Although this incident did not result in an accident it indicates that the contempt for safety procedures shown at Tokai-mura and Chernobyl is endemic to the nuclear industry.

What is the record of the nuclear industry in Scotland ?

Dounreay - in 1977 an explosion blew the lid off Dounreay's main waste shaft, scattering radioactivity round about. The seriousness of this incident was hushed up for 20 years. In September 1997 a report from the Nuclear Installations Inspectorate was severely critical, finding spent fuel in areas of the plant which were supposed to be shut down, nuclear waste in "paint cans", parts of the plant "awash with waste" and the risk of a serious nuclear accident "not being afforded the respect it deserves."



In May 1998 workers cut a power line to the plant's nuclear fuel processing area, fortunately out of commission at the time, resulting in a complete loss of power for 16 hours. In March 1999 inspectors discovered that monitoring equipment meant to give early warning of a release of radioactivity was turned off. In March 2000 UKAEA were fined £100,000 after three workers were contaminated with plutonium. In October 2000 SEPA released a report which found increased levels of radioactive plutonium in household dust of homes of nuclear employees living in Thurso near Dounreay. The report, written in 1994 but kept secret, suggests that worker-to-home transfer of radioactive material is responsible for the elevated plutonium levels found in homes in Thurso. In December 2000 a power cut similar to that of 1998 occurred but was not reported to regulators for a full 24 hours.

For nearly 20 years radioactive particles have been turning up around the Dounreay site, including on public beaches, with 12 turning up in the last year.

Chapelcross - in May 1999 SEPA issued a warning letter to BNFL following an incident when 13,000 gallons of effluent from a detention tank at Chapelcross was discharged to the Solway Firth on each of two days without first obtaining the pre-discharge sample required under the plant's liquid discharge authorisation. SEPA concluded that the cause was a combination of human error on the part of the plant operators and deficient procedures. In September 2000 BNFL were fined £5000 for polluting a burn near the Chapelcross station with radioactive waste.

Hunterston - one of the reactors at Hunterston B is currently shut because of a corroded boiler. Hunterston sources - During the decommissioning of the reactors at Hunterston 'A' BNFL have managed to lose 4 dangerous radioactive sources during 2000.



Torness - a study in 1999 found higher than expected radioactive discharges from Torness into the Firth of Forth.

Why not let the market decide ?

A really free market in energy would never invest in nuclear energy - it is far too expensive. City analysts told the Herald newspaper that such a politically sensitive and long term project would never be funded by the private sector. Angelos Anastasiou, a utilities analyst at Williams de Broe, dismissed the idea as a "complete non-starter". He said: "Without a subsidy - and a heavy one at that - from the government, it just won't happen ... The reason why British Energy appears to operate economically at present is that all the capital

costs of building its reactors were sunk on privatisation ... by the government ... But the government now is just not interested in giving the guarantees needed to make this plan work. Taking twice as long to build, and with higher operating costs, nuclear new-build is twice as expensive to run as gas-fired stations."

Research financed by the British Nuclear Industry Forum concluded that nuclear power required a subsidy of the order of £232 per year per kW of installed capacity. Already some renewables are cheaper than coal and nuclear and therefore require no subsidy.

A recent review saw the expected costs of cleaning up the contaminated nuclear facilities at Sellafield rise from £27bn to £34bn. No full size nuclear reactor has yet been fully decommissioned anywhere in the world, so the costs are unknown.

Where would a new station go ?

A few years ago a report on radioactive waste management revealed that the industry thought there might be 8 new reactors built in Scotland. By far the easiest option is clearly one of Scotland's four existing nuclear sites, where the power transmission infrastructure already exists and the local population have already put up with nuclear power for some time. Of these sites Dounreay is the least likely because it is remote from where the power would be used and UKAEA have made a recent commitment to clean up and leave the site. Of the other three possible sites all have attractions for the industry: British Energy purchased extra land at Hunterston some years ago, but the grid connections to Torness are better, and BNFL's Chapelcross site is already well connected to the English grid.

Will there be an energy gap ?

In late 1997 Friends of the Earth published 'Achieving the Possible,' a report looking at possible future energy strategies for Scotland. This study showed that we do not need more nuclear power. Better energy efficiency and an expanded renewables programme will allow Scotland to get through the medium term into the all-renewables future.

In 2000 the Royal Commission on Environmental Pollution produced a report on energy option for the UK, looking out to 2050 by when they expect the UK to have to reduce CO₂ emissions by 60%. They suggested 4 possible scenarios all of which required energy efficiency gains and new renewables, and only two of which required the construction of new nuclear or fossil-fuelled plants. The Commission's views on the acceptability of nuclear power are outlined above.

As part of their research on climate change issues, the Scottish Executive have commissioned research into possible emissions from the energy sector in Scotland over the next two decades. This new work will help to identify the right policies which will allow Scotland to do without nuclear power and reduce climate change emissions.

What are the alternatives ?

The total amount of sunshine reaching the Earth's surface is more than 10,000 times humanity's current rate of consumption of nuclear and fossil fuels. Energy from the sun is the ultimate source of renewable energy sources that range from solar electricity to biofuels and hydro, wind and wave power. However the huge potential of renewable energy is only just beginning to be tapped. Renewable energy does not present the radiation, accident and proliferation threats of nuclear power and it offers a sustainable way to meet the challenge of climate change.

Renewables are seen as having a very substantial role to play in the long term by most

institutions producing projections of future energy needs. Research by Shell, which assumes we become more sustainable, shows renewables meeting 40 per cent of world energy needs by the middle of this century, and in March 2000 a UK Parliamentary Select Committee reported that in order to meet the challenge of climate change a renewables target of 50% of UK electricity should be set. Today wind power from the latest turbines on good sites costs around 2p/kWh, which is cheaper than power from nuclear and new coal-fired stations, and almost competitive with the cheapest gas-fired plants. However, some other renewables still require subsidy and any on-going subsidy of nuclear power competes with these necessary subsidies. In addition to renewable energy another key part of the solution is energy efficiency. In September 1998, the World Energy Council, a high level federation of energy producers, concluded: "Increased efficiency in the end use of energy offers the most immediate, largest and most cost-effective opportunity to reduce consumption and environmental degradation." Different studies reach different conclusions on the actual improvement in energy efficiency that is possible - generally the range is from 30 to 50%. In April 1999 the UK Energy Saving Trust reported that they had identified a realistic programme of home energy efficiency measures to reduce annual emissions in the UK by 7.6 MtC by 2010 and in March 2000 the Department of Environment Transport and the Regions (DETR) estimated that there was a potential for almost 11 MtC savings in the business sector.

Do we need more nuclear power ?

Friends of the Earth believes that nuclear power has no role to play in developing solutions to climate change. On the evidence of the dangers of radiation, accidents, discharges, nuclear waste, nuclear proliferation and the nonsense of nuclear 'economics' nuclear power should be specifically excluded from our future energy strategies. Scotland's future lies in energy efficiency and renewable energy technologies, not with the nuclear white elephant.

Where can I find out more ?

Read our detailed reports 'Towards a Sustainable Scotland', 'Achieving the Possible' (on energy policy) and our briefing 'Climate Change and the Scottish Parliament'. See also 'Tomorrow's World: Britain's Share in a Sustainable Future,' Earthscan, 1998.



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