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THE SAFE ENERGY JOURNAL

SCRAM

No.81

February/March '91

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WHAT DO YOU MEAN
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NUCLEAR POWER' ?!



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**Plumbing the
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**Planning
for disasters**

**Energy
efficiency
and poverty**

**Byelorussia's
Chernobyl
legacy**

**Sustainable
energy
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**Keep
taking
the
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**New energy
review**

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COMMENT

A new form of 'eco-colonialism' appears to be rearing its ugly head, now that the economies of Eastern Europe have been opened up to the influences of the 'free market'. If environmental legislation or public opposition stops you building nuclear power stations in your own country, then what do you do? Build them in Eastern Europe and export the electricity back home.

The new fashion in the West is to develop new smaller, so-called 'safe' pressurised water reactor designs. If you can't build your prototype in the West, build it in Eastern Europe to 'prove' its safety and reliability, so you can get a license to build them at home, when the anti-nuclear movement has found new environmental malpractices to protest about.

The UK nuclear industry's plans have been well rehearsed in this magazine since the moratorium was announced in November 1989 - BNF plan new PWRs at Chapelcross and Calder Hall, the UKAEA plan a prototype 'safe' reactor at Winfrith, and Nuclear Electric are looking at new PWR designs and hoping to extend the life of their Magnox stations. What is perhaps less well known is that all the other Western nuclear industries are at it as well. Italy - where a moratorium was forced on the Government by a referendum - is spending £80m on 'safe' reactors and planning to build up to 13,000MW of new generating plant in the Soviet Union. Siemens/KWU is planning a prototype 'safe' reactor in Czechoslovakia to help them get a license to build them in Germany.

As the nuclear industry becomes increasingly multinational, we need to do just the same. The successful co-operation between groups from Germany, the Netherlands, England, Scotland and Shetland, in stopping a cargo of nuclear waste on its way from a research reactor in Germany to Dounreay in Scotland, shows just what can be achieved.

If the anti-nuclear movement in any one country sits back for just one second, that country will then become the victim of eco-colonialism. Following hard on the heels of 'safe' reactors will be nuclear waste dumps, and once the principal has been applied, all manner of ecological problems can be punted in their direction. Let's not get complacent.

THE Gulf War has shown the West the folly of relying on imported oil for such a large proportion of our energy supplies. The US cut back on funds to alternative energy development by 90% when Reagan was elected, and a promising programme stopped almost overnight. The UK has never really even started.

It has also demonstrated the dangers of relying on nuclear power as an alternative. Despite all the treaties, Iraq's two nuclear reactors were bombed out of existence at a very early stage. Thankfully they were only small, otherwise the consequences could have been disastrous. The political fallout could be much more serious. The Americans have driven a coach and horses through the Non-Proliferation Treaty which is due to be renewed in 1995. Who could blame any non-weapons state, if they decided to give the US two fingers, and build their own bomb.

While America has wrongly used the threat of an imminent Iraqi nuclear weapon as a justification for going to war, it is clear that Iraq would have eventually been able to achieve a nuclear capability. Israel is already believed to have 150 nuclear weapons, about half of the UK's capability. Pakistan is thought to be on the verge of building a nuclear bomb. If anything positive comes out of this war then let us hope it is a commitment on the part of the West to rapidly develop alternative energy sources, and to stamp out the use, trade and production of plutonium and highly enriched uranium.

scram, skram, v.
to shut-down a nuclear reactor in an emergency.

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<i>Comment</i>	2
<i>Nuclear News</i>	4-7
<i>Features</i>	8-21
<i>Safe Energy</i>	22-25
<i>Reviews</i>	26-27
<i>Letters</i>	27
<i>Little Black Rabbit</i>	28

FEATURES

8 Radiation protection topsy-turvy

Reducing the levels of radiation exposure in medical treatment should be a priority. **David Sumner**, a Principal Physicist with West of Scotland Health Board, calls for funding to improve equipment and the adoption of better procedures, to reduce patient doses.

10 Plumbing the ocean depths

Like so many other renewable energy systems, Ocean Thermal Energy Conversion (OTEC) is a simple idea stifled by lack of funding. **Mike Townsley** details recent developments and long term hopes for generating electricity from ocean heat.

12 Planning for disasters

A new directive from the European Community (EC) covering all areas of radiological emergencies planning is due to be implemented by all EC states by November 1991. The implications of the directive are examined by **Paul Mobbs**, Director of Banbury Environmental Research.

13 Energy efficiency and poverty

The Home Energy Efficiency Scheme was introduced by the Government at the start of this year. It is descended from a combination of earlier schemes, and **Ron Campbell** of Neighbourhood Energy Action explains the new system.

14 Byelorussia's Chernobyl legacy

The Chernobyl reactor site lies just five kilometers from the southern border of Byelorussia, and this Soviet Republic received over 70% of the fall-out from the 1986 accident. Unlike many West European countries, the devastating effects in the Soviet Union have received little attention. **Patrick Green**, Friends of the Earth's Radiation Campaigner, visited Byelorussia and assess the impact of the widespread radioactive contamination.

16 Sustainable energy development

The use of traditional institutional methods to solve fuel shortage in southern Africa have proved, at best, inadequate. A change of approach to Sustainable Development, embracing local culture and circumstances, is recommended by **Dave Spence**, a Development researcher.

18 Keep taking the tablets

While potassium iodate tablets are being distributed in Austria and Czechoslovakia because of fears of radioactive contamination from Czech nuclear reactors, the Czechoslovakian Government are planning to expand their nuclear programme, reports **Sebastian Klinke**, a student of political sciences at Bremen University.

20 New energy review

Mike Harper, Friends of the Earth's Assistant Energy Campaigner, argues that environmental considerations need to be fully included in the Governments renewable energy review, if the full value of these energy sources is to be recognised.

Returned to sender

TWO flasks of nuclear waste on their way from the German Physikalisch Technische Bundesanstalt (PTB) research reactor at Braunschweig to Dounreay in Scotland, were sent back in mid-January after failing to get loaded onto a ship in Rotterdam.

The 26 spent highly enriched uranium (HEU) fuel rods were due to be loaded onto a roll-on roll-off ferry bound for Liverpool, and then driven by road to Dounreay. However, Dutch dockers refused to load the waste onto two different ferries, the Companion Express and the Atlantic Compass.

The International Transport Federation, to which both the British and Dutch transport unions are affiliated, agreed in August last year that no union labour should handle nuclear waste unless it was to be loaded onto a purpose-built ship.

The permit issued by the Dutch government for loading the waste expired at 8am on 11 January. The Dutch government then ordered the waste to return to Germany. The future of the cargo is now uncertain, but another attempt to get it into the UK can be expected, possibly using a purpose-built ship. Nevertheless, this is a significant victory for the anti-nuclear movement, as it is the first time a consignment of spent fuel has been refused passage and returned to its source.

A spokesperson for Dounreay said in early February "the German company responsible for the movement of this material is still working through the very complicated procedures required to be followed before it can be sent to Dounreay."

A series of detailed discussions need to take place with a number of regulatory authorities and it could be some time before everything is finalised."

The UK Transport and General Workers' Union have said they would be sympathetic to any approach to black this type of cargo.

Apart from the safety questions raised by transporting spent nuclear fuel on non-purpose-built ships (SCRAM 79), concern has also been expressed about the proliferation dangers of transporting HEU around the world. "There was nothing to prevent anyone from helping themselves to the fuel, which was of sufficiently high grade to make nuclear weapons," says Françoise Verdeuzeldonk, a Dutch environmentalist.

Meanwhile, Gerry Jordan, Director of the Dounreay establishment, says "contracts to the value of over £18m have been signed or are under negotiation" as part of a determined effort to secure overseas reprocessing work. One of the deals he expected to strike was a £0.5m contract with Sweden, after a delegation from Dounreay visited that country in December. However, after representations from both the Icelandic Environment Minister and the Norwegian Nature Protection Organisation, the Swedish Government announced they had no plans to send spent fuel to Dounreay.

Another potential customer for Dounreay is the Lucas Heights nuclear research centre in Australia. It was revealed last August that the centre had held "preliminary discussions" with Dounreay (SCRAM 79). At the end of November, station manager, Frank Nicholson, stated quite categorically that no further talks

had been held.

Berlin's research reactor at the Hahn-Meitner Institute (HMI) can be expected to make another attempt to send spent fuel to Dounreay (SCRAM 77). After the collapse of the Red-Green coalition government in November, the new Environment Minister, Klaus Meisner, has overturned his predecessor's decision to refuse the reactor an operating licence. Meisner overruled former Green Senator, Michael Schreyer's decision after lawyers advised him that it was based on "procedural and legally material errors." Officials at HMI expect to be granted a licence in March.

A consignment of 40 spent HEU fuel elements from a research reactor near Bombay did get through to Dounreay in early February. The cargo is believed to have arrived at an English port and then travelled north by road. Unlike most of the other research reactors Dounreay is hoping to attract business from, the Indian reactor bought its fuel from Dounreay initially. A spokesperson for Dounreay said that, as the material was produced at Dounreay, it would not be returned after reprocessing.

■ The European Parliament's Committee on the Environment, Public Health and Consumer Protection has launched a major inquiry on the transport of nuclear waste. The Committee's President, Ken Collins, says there is a possibility that the committee will hold a public hearing on the subject. Collins, the MEP for Strathclyde East, had earlier asked the European Commission to block the movement of spent fuel from Germany to Dounreay. □

Fast reactor: slow death

THE German Fast Breeder Reactor at Kalkar may close at the end of 1991 after swallowing up a total of £2.5bn. The Government and the various companies involved will cover the maintenance costs until the end of the year, but it appears that the electricity utilities involved have no desire to support the project after that. Among details yet to be worked out is the question of compensation which may have to be paid to Belgian, Dutch and UK shareholders.

The SNR-300 fast reactor at Kalkar was completed in 1986, but because of political problems has never generated any electricity. The reactor, however, is loaded with fuel. The UK Atomic Energy Authority

(UKAEA) is hoping to buy the fuel in an attempt to keep the Dounreay fast reactor operating beyond 1994.

If the UKAEA does not order fresh fuel soon, shut-down in 1994 will be inevitable, but there is enough fast reactor fuel at Kalkar to keep Dounreay running for another 4 years.

Even if the UKAEA can come to some arrangement with Kalkar, it will still have to find the money to operate the reactor after 1994, so it is anxiously exploring possibilities with its partners in the European fast reactor collaboration. Electricity generated at the plant is sold to the Scottish grid, but the unit price would have to be doubled or tripled to cover running costs. □

Nuclear power revival?

BBRITISH Nuclear Fuels (BNF) has concluded after a £3m study that it would be both economic and feasible to build two new 1,500MW pressurised water reactors (PWRs). The plants would replace existing Magnox reactors at Chapelcross and Calder Hall at Sellafield.

BNF is now trying to find partners for the projects, but any decision to proceed will be left until after the 1994 Government review of nuclear power. The company believes that the PWR design that they have been looking at can generate electricity at around 3.5p per kilowatt hour (kWh) compared with around 5 or 6p per kWh for electricity from Sizewell B.

If the plants were to be built

they would not expect to be generating power until 2003. A further £5m study has now been approved.

BNF has already received approval from the Nuclear Installations Inspectorate to extend the life of its Magnox reactors from 30 to 40 years, and is hoping to add another 5 years. These reactors supply the Ministry of Defence (MoD) with weapons-grade plutonium, and one of the four reactors at Chapelcross provides tritium.

There is now a question mark over whether BNF will continue to do business with the MoD after the end of the century, as PWRs are not considered suitable for manufacturing weapons-grade material. □

Magnox re-run

NUCLEAR Electric (NE) is negotiating with the Nuclear Installations Inspectorate (NII) for permission to extend the life of its remaining seven magnox stations to 35 years.

NE believe they can sell power generated by the ageing stations in their last 5 years, for 1.5 p/kWh, because capital charges will have been paid off after 30 years.

National Power and PowerGen are not enthusiastic about the idea; they say it would be unfair competition. The magnox stations would be generating electricity more cheaply than brand new combined cycle gas turbine plant, which the soon to be privatised companies plan to build.

Radiation at the perimeter of the old magnox stations can be up to 20 times the maximum recommended dose for mem-

bers of the public, according to a report by NE's health and safety department. As the stations get older, doses to workers and the public are likely to increase. Residents close to Bradwell and Dungeness are the worst affected. Doses at houses near Bradwell can be as high as 0.3mSv, while Dungeness residents get another 0.11mSv from argon-41 gas emitted from the reactor.

Meanwhile the Trawsfynydd magnox plant in North Wales was shut down at the start of February, for at least 3 weeks according to NE, because of fears that welds in the pressure vessel could fail.

According to the NII, the welds are not yet "in the danger zone" but they may not be "sustainable for long-term operations". Weld failures can lead to overheating of the core, fire and meltdown.

Trawsfynydd is 25 years old and its continued operation depends on the result of the NII's long-term safety review which is expected later this year. □

Deep communities

EVIDENCE is growing that deep inside rock sediments, both on land and under sea, there are flourishing communities of bacteria.

Until now it was assumed that sites deep underground provide a stable environment for buried radioactive and other toxic waste. "Now you can't just assume that there won't be bacteria there", says researcher David Balkwill of Florida State University. Therefore until we know more about life underground it is impossible to prove that buried waste is safe. □



Hunterston hotspot

AN aerial radiation survey of part of Ayrshire has identified radioactive emissions ten times above normal background levels from an unused building at the Hunterston nuclear power station.

The survey was commissioned by three of the District Councils in Strathclyde on the fourth anniversary of Chernobyl, and carried out by the Scottish Universities Research and Reactor Centre (SURRC). The high level of activity was discovered close to Hunterston A. Scottish Nuclear were informed, and they conducted a prompt ground level investigation to identify the source of this activity.

Staff on the ground were able to pin-point the source as a precipitator tower which is used in the process of removing radioactivity from the water in spent fuel ponds. The tower is to be removed as part of the ongoing process of decommissioning Hunterston A.

Caesium-137 levels detected across the survey area were described as "acceptable", although raised levels were detected on salt marshes near Irvine and on the west coast of Great Cumbrae Island. This was probably derived from Sellafield, and possibly Hunterston, rather than Chernobyl. SURRC say "local sampling programmes here would be of interest". □

Deer Chernobyl

AN investigation into radioactivity in deer, commissioned by Roxburgh District Council in the Scottish Borders, has found that levels of Caesium-137 (Cs137) are continuing to increase. Samples from other animals, grass and soil in the Borders show that caesium levels have stabilised after the Chernobyl disaster.

No clear indication has yet been given as to why the levels in deer are rising while all other concentrations are stabilising. However, none of the levels recorded in venison samples exceeded the European Community's banning level of 1,000 becquerels per kilogram (Bq/kg), but readings of up to 426Bq/kg were found. Individuals who eat more than average quantities of the meat, including stalkers, have been warned.

Since Chernobyl, the UK Radiological Protection Board (NRPB) has reduced its recommended annual dose limit to the public from 1mSv to 0.5mSv. More recently, as new information has emerged from the Hiroshima and Nagasaki data, it is clear that to maintain the same level of risk estimate, the dose limit should be further reduced to 0.2mSv. Yet the recommended levels for banning the consumption of food have not changed.

In deriving the banning level for lamb, for example, it is assumed that the maximum consumption of meat in any one year would be 30kg. If the lamb were contaminated with 500Bq/kg, this would result in a dose of 0.18mSv.

Anyone consuming venison with around 500Bq/kg could, therefore, be exposing themselves to radiation at a level considered by the NRPB to be the maximum acceptable risk. □

MELTDOWN

Crispin Aubrey, Journalist, leading member of Stop Hinkley Expansion and one of the co-ordinators of their evidence to the Hinkley Inquiry, has a book due out on the 5th anniversary of Chernobyl: *Meltdown, the Collapse of the Nuclear Dream*. *Meltdown* exposes the truth behind the industry, which promised an endless supply of cheap, safe energy and simply failed to deliver. Nuclear power has been dealt a body blow by a unique combination of people power and business power. Aubrey also tries to answer the vexed question: if nuclear power is abandoned, what will take its place?

The publishers, Collins and Brown, have offered to donate £1 to SCRAM for every copy of the book they sell through us before publication. The book will cost £6.99 in the shops, but SCRAM readers can have it posted to them at no extra cost.

Send £6.99 to Collins and Brown, Mercury House, 195 Knightsbridge, London, SW7 1RE. Tell them you read about *Meltdown* in SCRAM.

Dump inquiry limited

NIREX will not present a full assessment of the long-term safety of its deep repository to the public inquiry to be held into its radioactive waste disposal plans, it has been revealed.

Nirex expects the first phase of geological investigations at Dounreay and Sellafield to be completed by this summer. They are hoping to decide which of the two sites they prefer by the end of this year. A planning application would then be submitted in the Autumn of 1992, with the planning inquiry expected to start around April 1993.

Nirex hope the Secretary of State will reach a decision by December 1994. This will allow a ten year period, starting with the shaft sinking, for the construction of the deep repository, permitting it to become operational by the target date of 2005.

The second phase of geological investigations is planned to start early this year, and might take place at both sites. It will continue throughout the public inquiry into the latter part of the 1990s. These studies are likely to include additional deep and shallow boreholes.

The Government's Radioactive Waste Management Advisory Committee (RWMAC) "is concerned that the safety

case to be presented at the public inquiry will be based on information derived from only two boreholes at each site". (There will actually now be five boreholes at Sellafield, but this doesn't alter their point).

RWMAC suggest a two-stage inquiry procedure. The first inquiry "would deal with all conventional infrastructure planning matters and seek approval for a deep shaft, sufficient underground development to prove the in situ conditions, and further deep drilling". The second stage inquiry would permit the "presentation of a full (but not final) safety case".

Nirex argue that this procedure would be repetitious, and that the adequacy of the geology is a matter for the regulatory bodies, the Nuclear Installations Inspec-

torate and Her Majesty's Inspectorate of Pollution, rather than a public inquiry. A "quite sound safety case" could be put to the inquiry "that is tolerant of surprises in the geology", according to Nirex director, Dr Ron Flowers. "There must be a small chance that Nirex could find something at variance with its assumptions, in which case Nirex would not proceed." Another Nirex spokesman said "it is conceivable that we might have to walk away, having spent ten years and £400m ... it's a risk we have to take".

An editorial in *The Scotsman* reminded us that "two authoritative committees have advised the government" that on-site storage is the preferred option. "A review of its policy is the least that it should do, even if that incurs some delay." □



Swedes keep phase out

SWEDEN'S ruling Social Democrats and two major opposition parties have agreed to stick to the 2010 deadline for scrapping nuclear power altogether, but the 1995 target to begin closing nuclear power stations has been abandoned.

The Government still believes it can provide all the energy it needs, and achieve its environmental goals, without nuclear power. They have promised to spend £352m to develop alternative sources of power and improve energy efficiency over the next five years (See page 25). Swede's voted in a referendum in 1980 to phase out nuclear power by 2010 (SCRAM 79). □

Italian rethink

ITALY is reconsidering the nuclear option according to *Atom*, the Journal of the UK Atomic Energy Authority. A five year moratorium was imposed on nuclear plant construction in Italy after a referendum in 1987.

Prime Minister, Giulio Andreotti, officially agreed at a cabinet meeting that the ban should be reviewed. Industry minister, Adolfo Battaglia, says "we must go forward to the second-generation safe reactors and find a way of disposing of waste."

The interministerial committee for

economic planning (CIPE) has allocated around £80m for research into new types of small so-called 'safe' reactors. The state-run utility, Enel, is co-ordinating activities.

They are currently involved in three projects for the development of safer pressurised water reactors - one with Westinghouse, another with General Electric and the third with Asea Brown Boveri.

The utility will subsequently study designs to select the one most suitable for Italy, prepare the detailed design, and ultimately plan for construction, assuming that political and public support can be regained. □

'California' in Europe?

THESE days we hear a lot of news about predicted energy shortages in the emerging democracies of Eastern Europe and Western companies rushing to their rescue offering them a nuclear fix. Besides the obvious desire of the western nuclear industry's to sell power stations and equipment to these countries, there seems to be another, underlying strategy: the so-called 'California syndrome'.

According to a study by Cambridge Energy Research Associates and Arthur Anderson Consultants, the 'California syndrome' has reached Europe. When government legislation and environment-

al opposition groups make it both difficult and expensive to find new sites for power stations, generating companies are drawn to areas of the least resistance and the lowest standards - like Eastern Europe.

For example, ENEL, Italy's state owned power-company, is discussing a plan with USSR officials to install 13,000MW of new capacity in the Soviet Union. One quarter of this energy would be exported under long-term contracts, back to Italy. EdF and Framatome are proposing to build two nuclear power stations in Hungary. Payment will be made partly in power supplies to Germany and Italy. Siemens/KWU have suggested financing the completion of a nuclear plant in Poland under similar conditions. □

Anti-Nuclear Network

A national get-together of the Anti-Nuclear Network will take place on the 5th Anniversary of Chernobyl. There are plans for action at Sizewell the following day.

The meeting will take place in Cambridge on 27 April. For further details contact Janet Ganguli, 31 Caxton End, Bourn, Cambridge, CB3 7SS (0954 719644).

Nuclear war

FORMER US Defence Secretary, James Schlesinger, has accused the Bush Administration of using misinformation about Iraq's nuclear weapons capability to justify going to war.

He says the administration have been trying to create the impression of an immediate Iraqi nuclear threat to bolster support for the War. According to US opinion polls the Iraqi nuclear threat was by far the most publicly acceptable justification for military action.

The consensus of scientific opinion appears to be that Iraq was at least two years, and perhaps as long as 10 years, away from acquiring a nuclear capability. One well placed US government official said: "While there may be good reasons for going to war ... Iraq's nuclear program isn't one of them."

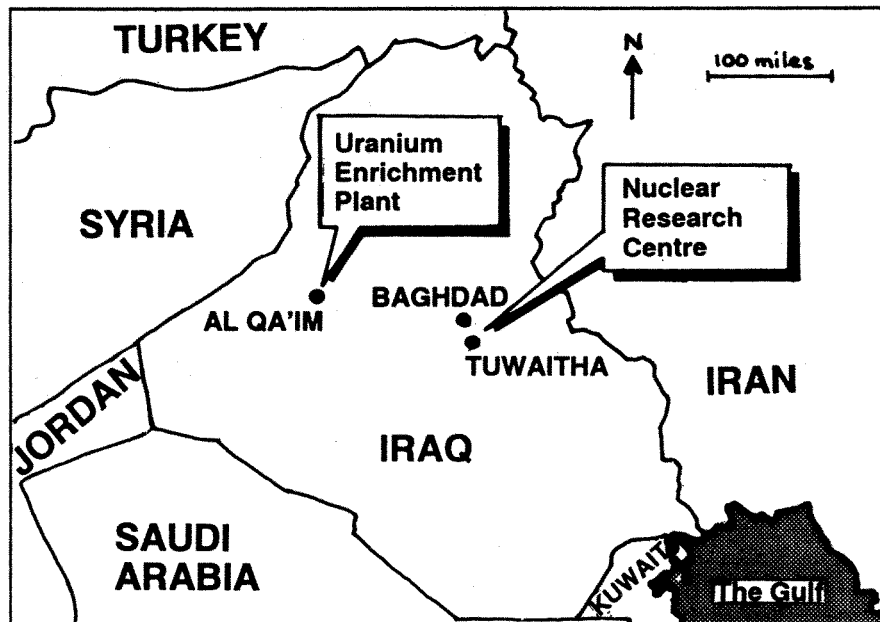
According to internationally published records, Iraq has only two tiny research reactors at the Tuwaitha Nuclear Research Centre, about 50 kilometres south of Baghdad. The IRT-5000 is a 5MW reactor supplied by the Soviet Union. The other is a 500kW Tammuz-2 reactor supplied by France as a replacement for the Osirak reactor which was bombed by Israel in 1981.

Of 22 kilograms (kg) of Highly Enriched Uranium (HEU) stored at Tuwaitha, 12.3kg is enriched to weapons grade, and the rest is about 80% enriched. As Iraq is a signatory to the Non-Proliferation Treaty (NPT), both reactors were examined every 6 months by inspectors from the International Atomic Energy Agency (IAEA). Nothing was found to suggest that either reactor was being misused on their last visit in November 1990. In any case the Tammuz-2 reactor was only completed in 1987, and has yet to be operated. The IRT-5000 reactor has only been operating part-time.

Bombing

The US announced the bombing of the Tuwaitha Research Centre in mid January. Since then some proliferation experts have expressed concern about the whereabouts of the weapons grade uranium. In theory it should still be intact and buried in the rubble, but it could have been removed after the IAEA inspection last November. About half of the 80% enriched uranium would have been in the core of the IRT-5000 reactor at the time of the bombing, and the remainder in the form of highly radioactive spent fuel.

Defence Week magazine has suggested that Iraq could use the 12.3kg of weapons grade uranium to build a primitive nuclear weapon for immediate use. Jonathan Spink of the European Proliferation Information Centre (EPIC) is more cautious. He points out that the normal critical mass of uranium is 49kg. With enough expertise the necessary amount could be re-



duced to nearer 25kg.

There is also evidence that Iraq has been attempting to develop uranium enrichment centrifuge technology, which could produce weapons grade uranium. In July last year customs officers at Frankfurt Airport intercepted some specially forged steel components known as 'centrifuge endcaps' en route to Iraq. Nevertheless, according to former Assistant Director General of the IAEA, David Fischer: "It is unlikely that Iraq possesses a single functioning centrifuge. In any event it would need more than 1,000 centrifuges to build one weapon in one year." The US are now hoping that air raids have wiped out any clandestine efforts by Iraq to develop uranium enrichment technology.

Paul Leventhal of the Washington based Nuclear Control Institute (NCI) warns that it may be "a mistake to focus exclusively on the expertise of Iraq's scientists and nuclear industry. Saddam Hussein doesn't need to manufacture the plutonium and enriched uranium essential for the bomb. He could conceivably buy what he needs in a nuclear black market or simply steal it."

Plutonium auction

In 1987 Channel 4's Dispatches programme revealed that in 1980 12kg of plutonium had been auctioned in Khar-toum. The programme alleged that this plutonium was bought by Iraq, and that this purchase prompted the Israeli bombing of the Osirak reactor a few months later. About 5kg of weapons grade plutonium is necessary to achieve a nuclear explosion.

Despite the best efforts of the IAEA, they can only estimate the plutonium inventories of large reprocessing plants. If the amount recovered from spent fuel falls within a certain margin of error, it is assumed that all bomb-grade material has been accounted for. In practice, enough weapons grade material to build 35 nuclear bombs could be diverted from a large reprocessing plant in a year without

being recognised as missing according to the NCI.

It is clear that Saddam Hussein is determined to achieve a nuclear capability, but even the most pessimistic assessment suggests that Iraq would have needed at least another 2 years to develop a deliverable device. If there is evidence of clandestine nuclear activity in a country which has signed the NPT, there are procedures for special inspection allowed for by the IAEA rules, which have never been tried out. Bombing the reactors rather than initiating these measures is certainly "a vote of no confidence in international safeguards" says Fischer.

Contamination risk

According to UK Defence Secretary, Tom King, the bombing was designed to "minimise the risk of contamination outside the sites or even outside the buildings." The IAEA say the bombing is unlikely to have caused any radiation hazard and there is no danger of another Chernobyl-type accident - in any case the reactors were probably shut down at the time of the bombing. On the other hand, destroying an operating reactor could contaminate the entire site with radioactive debris, according to Fischer: "It would be a very nasty cleanup". We will probably have to wait until the end of the war to learn the full extent of the contamination.

One of the main casualties of the Gulf War could be the NPT. The spectre of one signatory bombing the reactors belonging to another has some alarming implications. The current treaty expires in 1995, and events in the Gulf must surely cast doubt on whether it will be renewed in its present form. We must make sure that, rather than precipitating a mad scramble on the part of states to obtain nuclear weapons, these events lead to a realisation that the production of plutonium and HEU is just too dangerous and must end immediately. □

Considerable attention, and money, is directed at reducing public exposure to radiation from nuclear installations, much less attention is paid to the levels of exposure from medical sources. DAVID SUMNER, an expert on radiation and health, calls for comprehensive measures, properly funded, to reduce levels of radiation exposure in medicine.

Radiation protection topsy-turvy

THE sums spent on avoiding radiation make one wonder whether one is living in a developed country or topsy-turvy land ...

This is a quotation from an editorial in *The Lancet* of August 1988. What can it be referring to? The writer goes on to contrast the enormous sums of money being spent to reduce the discharges at Sellafield compared with the much smaller sums being spent on radiation protection in medicine. Is this justified? Just how dangerous are medical X-rays, and should we be spending more to reduce the dose from them?

In the UK about 25 million X-rays are taken each year, or 500 X-rays per 1000 people; one third of these are chest X-rays. If this seems a lot, it's only about half of the X-rays taken (per 1000 people) in the USA and France. In addition there are (in the UK) about nine million dental X-rays and 380,000 nuclear medicine procedures carried out every year. Nuclear medicine is a technique which is complementary to X-rays – a gamma-emitting radionuclide is injected into the body through a vein, and is concentrated in the particular organ under study; brain, liver, lungs and so on. The pattern of gamma rays coming out of the body is converted into a picture composed of dots by a device known as a gamma camera.

The ubiquitous pie charts published by the NRPB and others show that medical uses of radiation account for the single largest source of exposure to artificial radiation – an average of 12% of our total dose (2.5mSv per year), or 87% of the dose from artificial sources. The key word here is of course 'average'; many of us will not have had a single X-ray in 1990, whereas some people will have had several. Perhaps a more meaningful figure is the average radiation dose for those actually exposed to medical X-rays, which is about 3mSv, although this too conceals a wide variation. The effective dose equivalent from a chest X-ray is about 0.05mSv, whereas for a barium meal it is about 7mSv and for some nuclear medicine procedures – a thallium scan, for example, – the dose is as much as 18mSv.

What are the possible effects of all this exposure to radiation? According to JGB Russell, writing in the *British Journal*

of *Radiology*, the annual UK collective dose (i.e. average dose multiplied by the number of people exposed) is 16,000 man Sv. If we assume a linear model without threshold, and multiply the collective dose by the new NRPB risk factor, we get a prediction of 640 fatal cancers a year. Whether these deaths actually occur or not is impossible to say, as they would be submerged in a much greater total of 'natural' cancer deaths. But, there is ample evidence that exposure to relatively high doses of X-rays for diagnostic purposes can cause cancer. For example, women who received multiple fluoroscopies during treatment for Tuberculosis in the 1930s and 1940s have shown an increased incidence of breast cancer. And, of course, there is evidence of cancer in children as a result of pre-natal exposure to X-rays.

Risk reduction

If the cancer deaths are real, how could the risk be reduced? A recent report by a Working Party set up by the Royal College of Radiologists and NRPB is interesting and informative on this subject. In its very first paragraph it echoes the *Lancet* editorial, as it talks of:

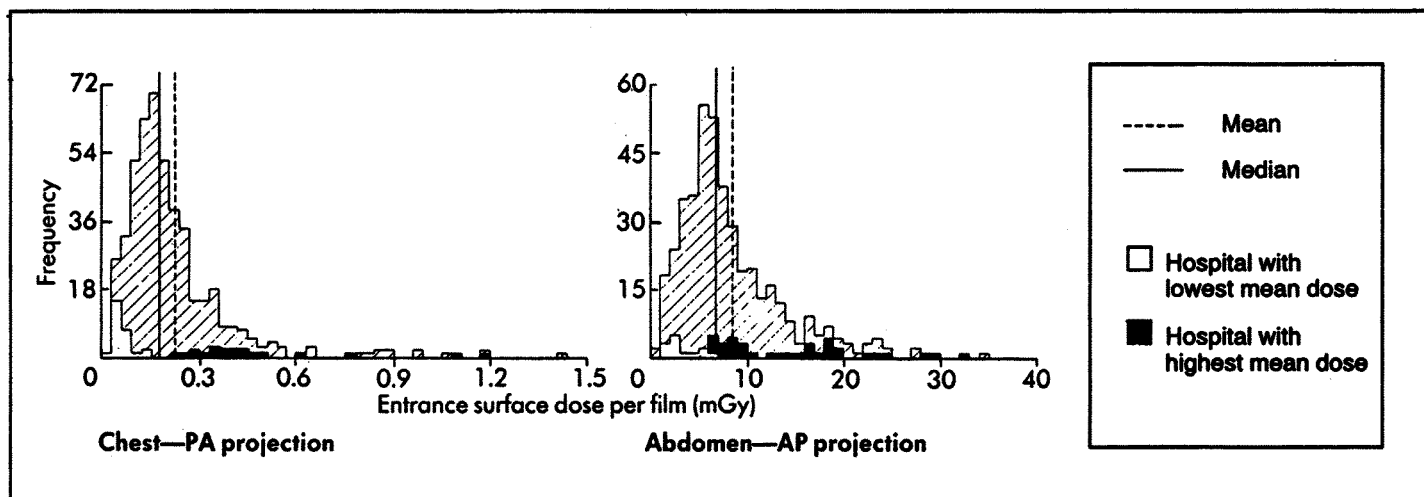
"... paradoxically high levels of expenditure in reducing radiation exposure by the nuclear industry compared with the economic stringency faced by many radiologists when seeking improved dose saving equipment in NHS hospitals."

The Report describes two ways in which patient dose could be reduced: changes in equipment and changes in procedure. Under the first heading, one of the simplest ways in which dose could be reduced concerns the screen, which sits next to the film and converts the impinging X-rays into light flashes which can then be recorded on film. The fluorescent material in the screen is usually either calcium tungstate or one of a variety of rare earth phosphors. Rare-earth screens are more efficient at converting X-rays into light than calcium tungstate screens, and therefore a film of the same quality can be obtained with a lower X-ray dose. Rare-earth screens have been available for some time, and are no more expensive than the traditional calcium tungstate screens; indeed, the Working

Party claim that in the longer term replacement of existing calcium tungstate screens would not cost anything, as the resulting increase in the life of the X-ray tube would offset the cost. Nevertheless, a recent study showed that rare-earth screens are used in less than a quarter of British X-ray examinations, compared with all of them in Italy.

Another way in which dose could be reduced is by the use of carbon fibre in table tops; carbon fibre absorbs less X-rays than conventional materials and hence a lower dose can be achieved without sacrificing picture quality. Unlike rare-earth screens, carbon fibre tables are not cheap, and for this reason are not very common in Britain – in a hard pressed NHS there is not usually enough money for radiation protection, a hazard often perceived as theoretical. More attractive (because cheaper) from a Hospital Manager's point of view are changes in procedure, and the Working Party Report makes a number of recommendations here. There must be scope for more uniformity of procedure across the country, as there is a large range of doses for the same X-ray examination; the Report quotes factors of between 20 and 100 (see figure). Some of these suggested changes in procedure are: minimising the size of the X-ray beam; choosing a lower density for the film; and (very important) proper shielding of the gonads (as the Report puts it: "there is evidence from a previous NRPB survey that such shields are not used as often as they might be"). The Report gives estimated reductions in patient dose that would result from each of these improvements. Use of gonad shields would give a very large potential dose reduction – 75%.

75% seems a big-reduction but it isn't the largest figure quoted. The largest is in fact 100%, a reduction to zero dose by not taking the X-ray at all. Why shouldn't the X-ray have been taken? Often an X-ray has to be repeated because an earlier one has been lost. In a study at a Glasgow hospital, published last year, 141 patients attending an orthopaedic clinic had had X-rays arranged by their general practitioners, but only nine patients had X-ray films available; of the 132 patients whose X-ray films were not available, 125 had their examination repeated.



Entrance surface dose per film during two common X-ray projections at 20 hospitals in England

An even more striking observation is this: the Working Party estimate that in about 20% of cases the X-ray was clinically unhelpful. Their wording is cautious but the message is clear:

"It would not be unreasonable to suggest that at least 20% of X-ray examinations currently carried out in the UK are clinically unhelpful in the sense that the probability of obtaining information useful for patient management is extremely low."

X-ray and nuclear medicine investigations are done for a very large number of reasons; sometimes it may be to confirm an already fairly definite diagnosis, sometimes because the diagnosis is genuinely in considerable doubt. Sometimes it may be just 'for interest', although research projects should have the approval of the local Ethical Committee and should only be done with the informed (and written) consent of the patient. There is now an enormous battery of tests available to the hospital doctor, and technology is changing faster than it can be properly evaluated. Sometimes a test is ordered 'because it's there' even though its value may be questionable, or there may be alternative tests, equally satisfactory, which do not involve radiation.

We shouldn't always blame the doctor for unnecessary X-rays though. Many of us want to be reassured by a normal X-ray that nothing is wrong with us (after an accident, for example), even though we may be told that an X-ray is not required I suspect that many doctors will now order an X-ray even though it isn't strictly necessary because of the fear of future litigation; an enormous problem in the USA and a growing one here.

SCRAM readers should certainly not be left with the impression that they should automatically object when the doctor sends them for an X-ray; it may be (and probably is) the best and

quickest way of investigating your problem.

So, coming back to my opening statement, are we really in topsy-turvy land? The Working Party discuss the cost effectiveness of introducing various options (eg. carbon fibre grids, rare-earth screens) and conclude that:

"... the cost per man Sv, even for relatively expensive items, such as carbon fibre table tops, is seen to be considerably lower than the monetary valuation of the harm from 1 man Sv in general radiology of £12,500 ... and even lower still than the figures of up to £500,000 per man Sv often quoted for expenditure on protection in the nuclear power industry."

Paying for reductions

So surely it would be better to direct some of the (large) sums of money spent on reducing discharges at Sellafield to radiation protection in medicine? The argument seems persuasive, and there is undoubtedly a very strong case for spending money in the NHS to improve X-ray equipment; but in my view things are not quite as simple as this. There are two problems with the argument. One is the question of risk-benefit analysis. Assuming of course that your X-ray examination is necessary, it has a clear individual benefit to you: it will speed your diagnosis and treatment. The benefits of environmental exposure to radiation are much less clear, certainly to a particular individual. Electricity, perhaps - but reprocessing?

The second problem with comparing the costs of avoiding a man Sv concerns the way the number of man Sv is actually calculated. We can be (reasonably) confident about measurements of the radiation doses we receive from X-ray procedures. But, doses from environmental radiation can only be estimated from complex modelling, with all its uncertainties.

This is especially true of the alpha emitting radionuclides such as plutonium. Admittedly the estimated doses are small; but you might like to ask someone working in the (medical) radiation field whether they would rather receive a dose of 2mSv from medical X-rays or 2mSv from environmental plutonium exposure; I think I know what the answer would be! As long as the problem of childhood leukaemia around some nuclear installations remains unsolved, I think we must be cautious about some of the estimated doses from environmental radioactivity. Yes, exposure to radiation must be reduced in medicine, but this is in addition to the cost of reducing discharges at Sellafield, not an alternative to it. □

References and Further Reading

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- The Radiation Exposure of the UK Population - 1988 Review* by Hughes J S, Shaw K B & O'Riordan M C. NRPB Report R227; 1989.
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- Unnecessary X-Ray examinations* by Bransby-Zachary M A P and Sutherland G R. British Medical Journal, 298, 1294; 1989.
- A comparison of diagnostic radiology practice and patient exposure in Britain, France and Italy* by Contento G, Malisan M R, Padovani R, Maccia C, Wall B F and Shrimpton C. British Journal of Radiology, 61, 143-152; 1988.

Using the temperature difference between the surface and depths of the ocean to generate electricity is a simple idea, involving what has been described as 'nothing more than sophisticated plumbing'. However, MIKE TOWNSLEY reports that, like many renewable energy schemes, development of Ocean Thermal Energy Conversion (OTEC) is currently restricted through lack of funding.

Plumbing the ocean depths

FIRST proposed by d'Arsonval in 1881, Ocean Thermal Energy Conversion (OTEC) relies by-and-large on proven technology. The principle is simple, it operates by exploiting the temperature difference between warm surface waters of the oceans over large tropical and sub-tropical areas of the globe, and the deeper waters in those locations which flow from the polar regions.

While many nations have dabbled with the idea since d'Arsonval, it wasn't until the 60s when the major oil and gas companies had made massive advances in marine engineering that it became a truly practical proposition. The real impetus, however, came during the 73-74 oil crisis when a number of designs were taken off the shelf and dusted down. There are active research programmes running in the UK, US, Japan, the Netherlands and India.

In the US, OTEC received a major boost when the 1980 OTEC R&D Act was passed. A demonstration fund was established, under the terms of the Act, backed by \$2 billion in Government Loan Guarantees. The US has its eyes on the Gulf of Mexico which provides several promising sites, which could provide base load power.

OTEC Aloha

Some of the American money was used to build a pilot scheme in Hawaii. Funds for the project have also been provided by the State of Hawaii for the project dubbed 'mini-OTEC'. It is operated by the University of Hawaii's Natural Energy Lab (NEL) which has been examining OTEC since 1972, before the oil crisis. William Whitmore of Lockheed Engineering, the company which designed the plant, is quick to point out the simplicity of OTEC which he describes as "nothing more than sophisticated plumbing."

Considerable flexibility exists in the way OTEC can be deployed, including closed cycles, open cycles, floating, land based, shelf/tower based, or 'grazing'. It can also have a variety of end products including electricity generation, aqua culture (cultivation of plants or breeding of animals in water), desalination or any combination of these.

Tom Daniel of NEL is well aware of the importance of the so-called spin-offs. Aqua culture on Hawaii has led to very successful fish farming and flower growing, both of which are commercial ventures. The water which is brought up from the deep is not only cold, it is pure and full of nutrients. Daneil enthuses, "These spin-offs are potentially beneficial and economically viable even without electricity generation."

'Grazing' OTEC plants, ie. those which move either freely with currents, or under their own power, can be used to recover and process deep ocean minerals, produce liquid hydrogen, liquid ammonia and the like for trans-shipment to other areas to be used in industrial processes and power generation. The 'grazing' option would only be exercised over a longer timescale as, amongst other things, a broad agreement on a Law of the Sea Convention would be required.

Research

For most OTEC designs the component technology is well developed. Much of this technology has already gained a clean bill of health for operation in the types of stressful marine environment best suited to exploitation. However, there are some significant exceptions to this. Four specific items require further development: cold water pipe, heat exchangers, moorings, and power transmission to shore. It is these areas that national research programmes are focusing on.

Fundamental to the economics of an OTEC plant is the efficiency of the heat exchangers. Operating efficiency is extremely dependent upon minimising the fouling and corrosion products on the heat exchanger surfaces. The low temperature difference also dictates that the surface area of the heat exchanger has to be very large. This problem has meant that in experimental designs the heat exchanger cost has equalled roughly half that of the whole plant. Recent developments, however, suggest that this cost can be brought down to around 10% of the total.

Floating OTECs present their own special problems. Keeping the plant in place by means of mooring will need

site specific solutions. For depths up to a few hundred meters conventional techniques, such as chains and cables, can be used as there is enough experience with them in other marine applications, however, their weight might cause difficulties. Synthetic fibre ropes may be an alternative. For large depths, up to 2,000m, mooring is not possible, so some sort of propulsion system will be required to keep the plant in place.

Transmitting the power from a system to shore in depths of over 600m presents engineers with a new challenge. Although the resource at great depths would not be exploited initially, as operating experience will be best gained in shallower water, the depths will need to be conquered if the full potential of OTEC is to be used.

Costs

OTEC will also have to circumnavigate the conventional world of accounting which is biased against high capital cost low fuel cost (there is no fuel cost) alternative energy sources. OTEC scientists currently put the price of an installed kilowatt at a few thousand pounds while for oil plant it is only a few hundred pounds. Therefore the balance between operating cost and high interest payments on the capital costs will be central to the economic prospects of exploitation. Current estimates for a 10 MW floating OTEC plant put the unit cost of electricity at 8.5p. Costs will inevitably fall as a result of further development.

Latest prices for a UK design 10MW plant, taking account of recent improvements in heat exchanger design, give estimated generating costs of around 5.5p/kWh. This cost is based on temperature gradients of 20°C. For every °C increase the generating costs drop by 10%, therefore, using the large sites with a temperature gradient of 22°C the cost drops to 4.4p/kWh. If these costings can be verified when full scale demonstration plant are built and run, then islands in the Indian Ocean, where power generation costs about 16.7p/kWh, are going to take a very keen interest.

OTEC has minimal environmental impact. The main problems are possible leakages of operating fluids, what to do with the chlorine solution used to keep

the system free of pollutants, and the potential effects of discharging warm and cold waste water. Leakages of the working fluid (freon or ammonia) although not exactly desirable would have only a small effect and would be quickly neutralised by the sea; therefore any impact would be local. Designers are working on plans to recycle the chlorine or collect it for suitable disposal. The warm and cold water discharges are minimal, the only real effect would be on the operating efficiency of the plant. Visual impact would also be small.

Funding

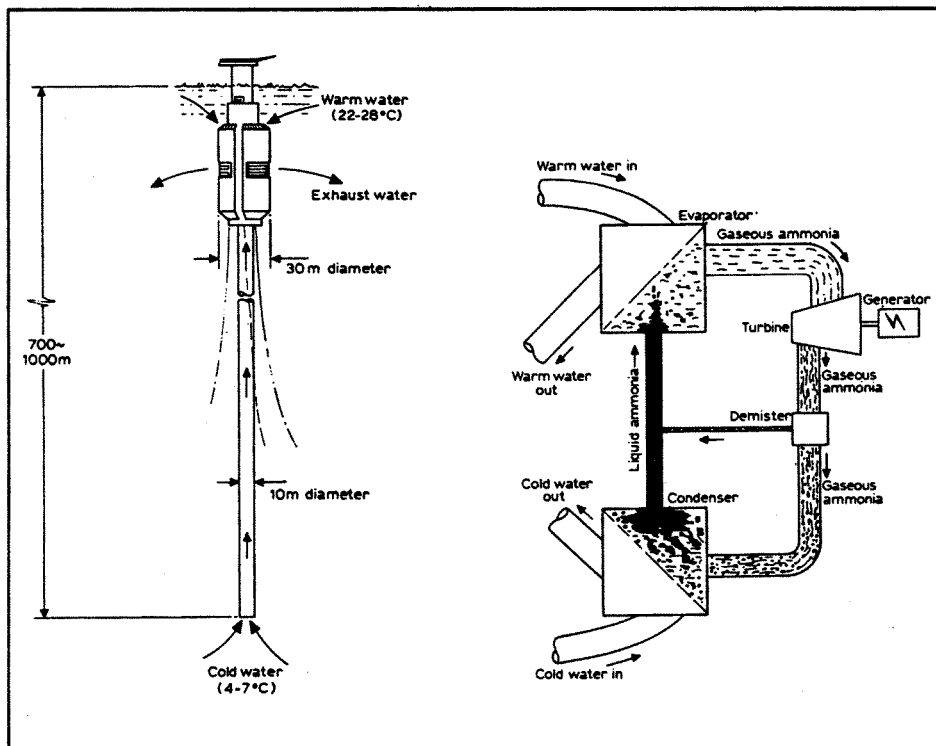
Perhaps the greatest hurdles for OTEC to cross are institutional - financial and legal. This is the case for many alternative energy sources.

Once OTEC reaches the stage of being commercially proven, after several megawatt prototypes have been built, then, if the work on the drawing board translates into reality, there should be little difficulty in gaining funding. However, the current stage of development is when funding is difficult and when international funding agencies come into their own. Money in the form of grants, low interest loans and backing from the commercial sector is the only real way forward.

Indeed this position is supported by the World Bank who argue that measures must be adopted which will allow "an expansion of investment to develop those indigenous sources of energy that are cheaper than imported oil." It continues: "the investment needed to develop the developing countries' potential energy resources is estimated at US\$130 billion a year (1982 prices) for the next ten years", and "even if international oil prices fall to US\$25/barrel, most of these investments ... would remain attractive."

On the legal side the problems are fast disappearing, for near shore devices at least. The new trend for countries to declare 200 mile Economic Exclusion Zones (EEZs) means the legal regime for OTEC plants is simplifying, and even becoming advantageous to many small island nations. Fiji, for example, has a sea to land area ratio of 70 to 1 and for Kiribati, also in the Pacific, that ratio is 4,000 to 1. Problems may be encountered as stations begin to wander out into open seas. However, this is not seen as a major problem for the near future but for later in the 21st century.

A temperature gradient of 20°C is assumed as the threshold for OTEC viability, which means a home market



Two examples of OTEC systems, one open cycle, the other closed

doesn't exist for OTEC in the UK, but that does not mean that it is of no interest to UK companies. In other nations of the Commonwealth the resource is large. Estimates of the world market for OTEC generating plant have been made by the USA, Japan, France and the UK. The US study estimates that for the period 1990-2010 nearly 60,000MW of plant could be ordered. Japan estimates that for its Southern Islands over 20 floating plants and at least 6 land based plants will be built by 2000. Also, they see considerable opportunities within their 200 mile EEZ, estimating that some 220 plants of about 1 MW could be built early in the next century.

UK estimates

UK calculations are more conservative, but none the less encouraging. By 2010 UK estimates say there will be around 1,030 OTEC plants operating world-wide, nearly half of which will be no larger than 10MW, and less than 10% being greater than 100MW. All these calculations are based on power production only and do not take account of other OTEC products such as aqua culture, desalination, synthesis of ammonia and hydrogen, and refining ores. However, the world-wide total for these applications has been put at 500,000 MW.

The absence of a home market is a disadvantage, but only a small one, which is easily balanced by the advantages of UK expertise, both manufacturing and engineering. Indeed, the component parts of an OTEC station, without exception, could

all be manufactured in the UK. The hull, whether steel or concrete, can provide much needed work for shipyards or platform fabrication yards. The electrical engineering equipment, heat exchangers, pumps, turbines and associated piping and ducts could be delivered from established heavy mechanical and electrical engineering contractors.

Based on the figures used earlier, this could provide an export market to the UK of around £650 million a year from the mid-90s. As most of the orders for OTEC would come from developing countries it would be necessary to take into account their needs for technology transfer. By offering turn-key projects - along the lines of the successful Norwegian wave-plant agreements - the UK could increase its share of the market.

The all too familiar 'Catch-22' situation, where a new technology must be proven to attract funding and to be proven it first needs funding, must be overcome. Pollution is an international problem and can only be tackled on an international level. OTEC has the potential to prevent much of the third world from following the Western energy path, it is in the West's interest both financial and environmental to promote it. As, John Waihee, the mayor of Hawaii, puts it "people may be reluctant to fund OTEC research because the price of oil is so low, causing people to be lackadaisical about progress. Yet we all know the price will rise. This is precisely the time to do the research, when the prices rise again we will need an alternative." □

On the 27 November 1989 the European Community published a new directive covering all areas of planning for radiological emergencies. PAUL MOBBS, Director of Banbury Environmental Research examines the implications.

Planning for disasters

THE emergency planning directive, 89/618/Euratom⁽¹⁾, specifically deals with informing the public about health measures to be applied, and steps to be taken, in the event of a radiological emergency. It is due to be implemented by all EC states by November 1991.

Responsibility for its implementation in the UK rests with the Health and Safety Executive (HSE) and the Department of Energy (DoEn), but neither are prepared to state whether they will implement the directive in full, nor whether this will be completed by November 1991. Thus far they have only indicated that it is possible that implementation will be done on a site by site basis in discussion with the site operators.

This directive is a step on from the previous one drawn up post Chernobyl (directive 87/600/Euratom) and is intended to define, at a Community level, common standards for measures and general procedures for informing the general public and improving public protection in the event of a radiological emergency. A 'catch all' clause means that the directive covers all radiological hazards, specifically:

- a) any nuclear reactor, wherever located;
- b) any other nuclear fuel cycle facility;
- c) any radioactive waste management facility;
- d) the transport and storage of nuclear fuels or radioactive wastes;
- e) the manufacture, use, storage, disposal and transport of radioisotopes for agricultural, industrial, medical and related scientific and research purposes;
- f) the use of radioisotopes for power generation in space vehicles.

The directive sets minimum requirements for the type of information to be supplied to the public who may be at risk from an incident at their local site, and it requires this information to be issued automatically. It must to be issued as soon as any new emergency plans are completed. If any changes are made in the plans, the updated information must also be circulated. The information must include details of:

- a) what radioactivity is and its effects on human beings and the environment;
- b) various types of radiological emergencies and their consequences for the general public;
- c) emergency measures to be taken to alert, protect and assist the general public; what action to take in case of an emergency locally.

In the event of an incident involving a release of radioactivity likely to breach radiological protection standards for those around the site, the state/operator must inform the population affected immediately of the steps they should take to safeguard their health. This information must consist of:

- a) details of the type of emergency which has occurred, and where possible its characteristics, origin and probable development;
- b) advice on radiological protection measures covering action to take to minimise dose, decontamination, restrictions on the consumption of foodstuffs, use of protective substances and evacuation (if necessary).

Advance warning

Should the alert be raised before a possible incident, similar information is also required to be issued, along with information on how to prepare for the incident, and advice to those groups particularly affected (eg. children).

Any person who may be involved in providing emergency assistance (eg. police, medics) must be provided with similar information to that issued to the public, but also concentrating on what their intervention may mean for their health, and what steps to take to ensure as little risk as possible. This again must be done as soon as plans are drawn up. Regular updates must also be supplied if any new information comes to light.

The directive is a major step forward from the current position, where the emergency measures taken depend upon the facility concerned, or the level of planning which a local authority has been able to progress to. The directive sets minimum requirements, and puts the onus on the government to provide information to the public and

emergency service personnel. This is good in two respects. Firstly it will prepare the public for possible radiological incidents in the future, and will perhaps reduce the casualties in any such incident. Secondly, it will bring home to the public, especially those around nuclear installations, the risk implicit in the everyday operations of the nuclear industry.

The fact that it covers all radiological hazards means that it also has implications for the transport of radioactive materials. It could be argued that any road or rail route which is regularly used to carry radioactive materials of a high specific radioactivity would fall under this directive, and the local authorities should draw up emergency plans and issue information to those living along the route. Again this could have important implications for the way in which the public perceive and react to the actions of the nuclear industry in the UK.

It is important that all those concerned should put pressure on the HSE and the DoEn to ensure that the requirements are met as soon as possible. As this will probably be implemented on a site by site basis, it is also important that there is input at the local level. Local authorities should be made aware of the requirements of the directive before any plans are drawn up. For those campaigning on nuclear issues, it is also important that any information issued as a result of this directive is assessed to ensure its accuracy and 'truthfulness', so that a balanced view about the real risks involved in the nuclear industry is put forward.

If we are truly to take a step forward in preparing ourselves for future nuclear accidents, we must press for full implementation of this directive as soon as possible. □

Notes and references

1 Directive 89/618/Euratom, *Official Journal of the European Communities* 7/12/89 (357/31-34).

For further information contact Paul Mobbs, Banbury Environmental Research Group, 3 Grosvenor Road, Banbury, Oxfordshire OX16 8HN.

For those interested in fuel poverty and domestic energy, the new year brought more than throbbing headaches, guilty consciences and pious resolutions. The Home Energy Efficiency Scheme became operational on January 1st. RON CAMPBELL, of Neighbourhood Energy Action, explains the good and the bad of the new scheme.

Energy efficiency and poverty

THE genealogy of the Home Energy Efficiency Scheme (HEES) is quite colourful, descended as it is from a combination of the energy efficiency assistance available to low-income households over the past decade or so. This aid consisted of funding for loft insulation, under the Homes Insulation Scheme (lost to householders in England and Wales in April 1990), and draughtproofing under first the single payments regulation of Supplementary Benefit and then the Energy Grant administered by the Manpower Services Commission and available only through community insulation projects.

Since work with low-income households was almost entirely restricted to that carried out by community energy projects, the damage done to the network of projects following the replacement of the Community Programme with Employment Training⁽¹⁾ made some reaction essential.

The response has now appeared in the form of HEES – a system of grants to pay for loft insulation and/or draughtproofing, tank and pipe lagging and energy advice for householders in receipt of Income Support, Housing Benefit, Family Credit or Community Charge Benefit.

Advantages

The major advantages of the new scheme are that it comprises a package of possible measures available under the grant, that for the first time there is some provision for energy advice, and that the grant is not restricted to use of a training scheme.

After a fairly frantic consultation process, the details of the scheme have been finalised and Neighbourhood Energy Action (NEA) has been successful in the tender process to establish a grants agency for the administration of the scheme. It is hoped that the agency which will employ up to 80 staff will process some 250,000 grants in the first full year of the scheme 1991/92.

So far, so good! Even better, the provision of the Social Security Act



which authorises the Home Energy Efficiency Scheme can, in theory, be used for more substantial work, including improvements to appliances, lighting, and space and water heating.

These then are the positive aspects of the scheme, but the consultation process revealed disappointment and discontent with the paucity of the budget and concern over many other areas. Not the least of these is the requirement for a client contribution – in theory the non grant aided element can be met from external sources such as a hardship fund, but in practice the recipient will have to meet some of the cost out of a very limited income. Normally the client would be expected to contribute £7 for draughtproofing, £10 for loft insulation or £15 for a job comprising both elements.

Limited advice

A further cause of disappointment was the treatment of the advice element of the grant. Although there is no client contribution in this case, the sum set at £10 is disappointingly low and clearly will not fund the sort of in-depth case work required in fuel debt work. Additionally the grant for advice is only available where practical work is being carried out in the home, reinforcing the suspicion that energy advice is seen more as the provision of 'handy hints' on energy saving.

The initial statement from the Department of Energy had led many to believe that the Government was anxious to retain substantial voluntary sector involvement in the new scheme, since it was apparently anticipated that community energy projects would evolve into community businesses, thus ensuring that the profit motive should not dominate what is after all more a public service than a commercial contract.

It now transpires that this belief was rather naive and that there will be few, if any, privileges granted to non-

commercial projects. That the work will be carried out by the private sector is not necessarily bad, the profit motive may be able to combine quantity of work with quality, but it will be sad if the voluntary sector is marginalised.

A further difficulty arises in trying to relate the Government's aims for the scheme to the budget available. Clearly a target of 250,000 jobs funded implies that the average grant will be about £100 – considerably below the maximum level for a draughtproofing job alone, if carried out by the commercial sector.

Fuel poverty

There are three categories of grant with different amounts payable depending on whether the work is done by a contractor, by an agency using trainee labour, or on a DIY basis. The third option has the advantage that no one will be excluded from assistance simply because they live in an area without access to an energy project (as was the case with the energy grant), on the other hand it will be difficult to ensure the quality of work.

A recent report⁽²⁾, of which NEA was co-sponsor, suggests that a permanent solution to fuel poverty would require expenditure of some £15 billion over the next 12 years. Whilst it would be churlish not to acknowledge the good intention of the Home Energy Efficiency Scheme, it must be considered as a gesture rather than a major contribution to solving the problem of fuel poverty.

On an optimistic note the legislation does provide scope for a much more comprehensive system of grants. NEA will continue to press, in association with other concerned organisations, to ensure that the latent powers of the Social Security Act become a reality. □

Notes

1. Documented in *Energy Efficiency and Employment Training: One Year On. Neighbourhood Energy Action; November 1989.*

2. *Fuel Poverty and the Greenhouse Effect.* NEA, FoE, The National Right to Fuel Campaign and Heatwise Glasgow; April 1990, £5. Available from NEA, 2/4 Bigg Market, Newcastle upon Tyne, NE1 1UW.

In late November last year PATRICK GREEN, Friends of the Earth's Radiation Campaigner visited Byelorussia in the Soviet Union along with a group of British doctors to assess the impact of the Chernobyl nuclear accident. The visit was organised following an invitation from the Byelorussian Academy of Sciences.

Byelorussia's Chernobyl legacy

FOLLOWING the Chernobyl nuclear accident on 26 April 1986 radioactive fall-out was widely distributed over the eastern territories of the Soviet Union and over Europe. While the effects in Europe have been well documented and have received widespread media attention, less is known about the effects within the Soviet Union. The general picture that has been painted is that while the accident was serious, it wasn't that bad and the resulting contamination is something that can be lived with. The truth couldn't be further from this.

The Chernobyl nuclear plant is situated in the Soviet Republic of the Ukraine, approximately five kilometres from the border with the Republic of Byelorussia. Over 70% of the radioactive fall-out descended into Byelorussia, seriously contaminating over 18% of its territory, over 20% of the Republic's agriculture and forestry is situated in these contaminated areas.

The bulk of the contamination is due to Caesium-137, although nearer the reactor, and in various hotspots there is also contamination from Strontium-90, and plutonium-239/240. In terms of the caesium contamination this is divided into four zones:

- (i) Over 40 Curies per square kilometre (Ci/km^2), [1.48 Megabecquerels per square metre (MBq/m^2)]
- (ii) 15-40 Ci/km^2 , [555 kBq/m^2 -1.48 MBq/m^2]
- (iii) 5-15 Ci/km^2 , [185-555 MBq/m^2]
- (iv) 1-5 Ci/km^2 , [37 kBq/m^2 -185 kBq/m^2]

The largest 40 Ci/km^2 plus zone is in the 30km exclusion area around the reactor, from which 24,700 Byelorussian's were evacuated in 1986. However, the latest Byelorussian contamination map still shows 16 hotspots with contamination in excess of 40 Ci/km^2 . No one from these areas, or any other contaminated area has been evacuated since 1986. Of the 24,700 that were evacuated many have been relocated in other contaminated areas!

At present around 2.2 million people live in the contaminated zones. Of these around 100,000 live in areas with contamination levels over 15 Ci/km^2 . The USSR Ministry of Public Health estimates that, over a lifetime living in the 15 Ci zone, around 82,511 people will receive doses up to 350mSv. A further 10,073 will receive doses between 350 and 550mSv and 8,183 will receive doses over 550mSv. However, these dose estimates are only based

upon exposure to caesium-137, and to a lesser extent caesium-134. Inhalation doses from resuspension and the dose from strontium-90 or plutonium-239/240 are ignored. They are considered to be negligible!

In the UK such doses would be regarded as completely unacceptable, yet the West is supporting the lifetime dose limit, of 350mSv, recommended by the USSR National Committee for Radiation Protection. The Soviet Ministry of Health had acknowledged that while this lifetime limit averages out at 5mSv per year, exposures between 3-5 times higher than this are likely to be received by those living in the contaminated territories in the years immediately following the accident.

No relocation

The Ministry has also argued that relocation is not necessary for the first group (up to 350mSv) and will probably not be necessary for the second group (350-550mSv) as various 'special agricultural measures' could reduce contamination levels in food by a factor of two-three. These special measures include deep ploughing to depths of greater than 1 metre. However, these special measures may also render arable land 'unproductive', according to the UKAEA. They also mean that if it is subsequently decided to remove the contamination a larger volume of soil has to be dealt with.

The Ministry also claimed that "the majority of population centres in the second group, and some even in the third group, may possibly be returned to pre-accident living conditions"!

The Soviet safety standard has been endorsed by a number of Western scientists from the International Atomic Energy Agency (IAEA), the World Health Organisation and from the International Commission on Radiological Protection (ICRP). Dan Beninson, the ICRP chair has even suggested that the limit could be higher! However, this is in direct contradiction to the ICRP's own recommendation, made in 1985, which suggested that a limit of one fifth of that chosen by



The village of Khnockl in the 15-40 Ci/km^2 zone

Moscow should apply for members of the public exposed to radiation. The ICRP's lifetime limit of 70mSv was repeated in its draft 1990 recommendations. Within this limit, a subsidiary limit of 5mSv in any year may apply. This limit was recommended before the ICRP acknowledged that the risks of radiation were five times higher than recognised previously.

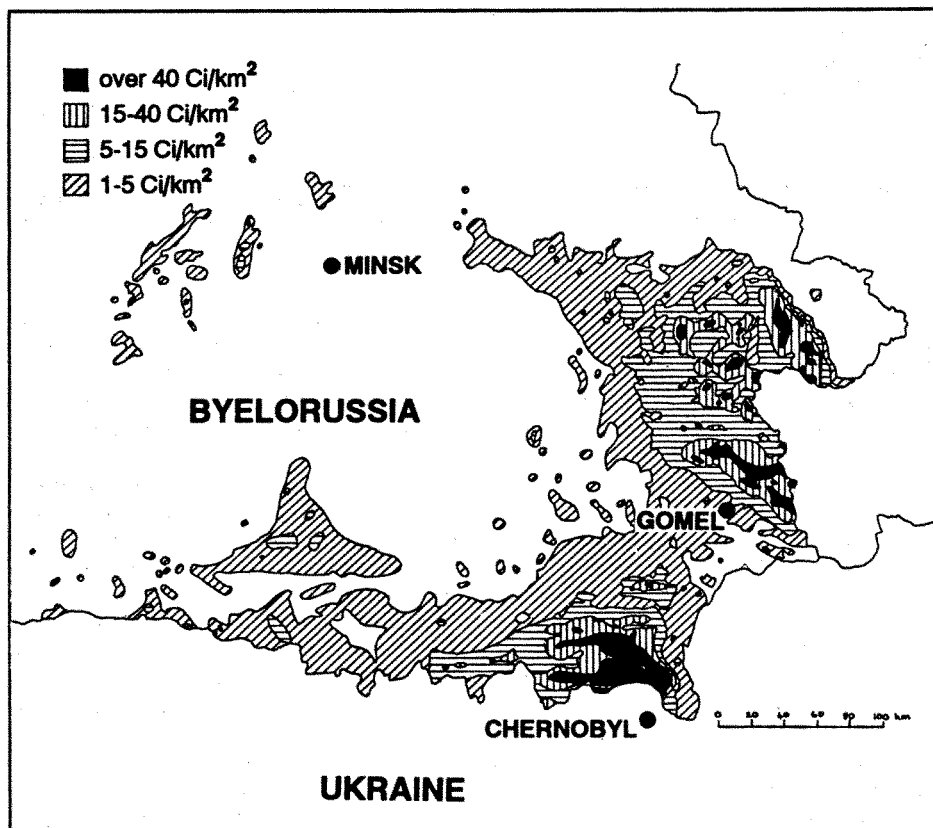
Not surprisingly, the Byelorussians don't agree with Moscow and the Western 'experts'. On 5 December last year its Parliament voted to reduce the lifetime dose limit by a factor of five, in line with the 1985 ICRP recommendation. This would mean a maximum annual dose of 1 mSv. If this limit is enforced and used as the criteria for assessing whether people should be relocated from the contaminated areas it will mean that the Byelorussians have adopted more stringent standards than those recommended by the British NRPB. The NRPB recommend that relocation should not be considered until a person has received an annual dose of 3mSv.

Even the League of Red Cross and Red Crescent societies are supporting the Moscow line that the contamination does not present a health risk. The Red Cross has made a number of visits to the USSR. In February last year Professor Albrecht Kellerer, the chair of West Germany's national radiation protection committee, stated, on behalf of the Red Cross, that none of the health effects being diagnosed in people living in the contaminated areas were due to radiation. A view repeated by the British Red Cross in June last year:

"Psychological distress, and anxiety about the consequences of radiation, are probably the main side effects of the 1986 Chernobyl disaster".

This claim has also been made by a number of other Western 'experts'. Radiophobia, so we are told, is the main health problem post Chernobyl. Unfortunately, for the proponents of this theory, the scientific data is just not good enough to argue that there have not been any health effects following the accident. What data does exist is subject to a number of uncertainties. However, in Byelorussia at least, it tends to suggest that the incidence of thyroid disease, leukaemia and genetic disease is increasing post Chernobyl.

However, routinely collected statistics such as these can only provide an general indicator of a medical trend. An increasing trend is not the same as demonstrating a cause and effect relationship with radiation exposure. Evidence for this can only be provided through properly controlled



Caesium-137 contamination levels in Byelorussia, 1990

epidemiological studies. Even then, however, the combination of the influence of other environmental pollutants and uncertainties over radiation doses will make the data extremely difficult to interpret. All that can be said at this time is that health effects are to be expected and anecdotal evidence suggests that the incidence of some diseases is rising. One can surmise that this is probably due to Chernobyl and should be investigated as a matter of urgency.

IAEA optimists

Most parties would agree on the need for epidemiological surveys to be conducted. The main question is who should conduct them? The IAEA has set up a Chernobyl research centre in the Soviet Union. Several Western agencies are also participating in the IAEA work. These include the UN Scientific Committee on the Effects of Atomic Energy (UNSCEAR), the Food and Agricultural Organisation (FAO) and the World Health Organisation. The Commission of the European Communities is also taking part.

The IAEA was also one of the most resolute optimists about Chernobyl in the period following the accident. In 1987 top IAEA officials held a five day visit to the USSR and reported that the first post-accident assessment of the potential health impact was "too pessimistic" and that "if anything, there will be a modification downward of early calculations of risks and

predictions of health consequences". However, it should be pointed out that the objectives of the IAEA are incompatible with investigating the health consequence of the world's worst nuclear accident. The IAEA's statute requires it to promote the peaceful uses of nuclear power. Expressing this concern is not accusing the IAEA of deliberate bias. But, it is very worrying that an increasing number of so called international experts seem to have made their minds up that the only health effect is radiophobia.

Questions should also be asked about just who will be included in these studies. The Soviets are reported to have established registers of all those evacuated during 1986. However, the Byelorussian's expressed concern during my visit that some of those who received the largest doses will be excluded from any study. Some of the largest doses would have been received by the 600,000 miners and soldiers involved in building the sarcophagus around the reactor during 1986. The army are not included in the health registers.

However, the need for properly controlled epidemiological studies should not be allowed to overshadow the fact that in Byelorussia, over two million people are still living in heavily contaminated areas four and half years after the accident. Of these, 100,000 people still live in areas of gross contamination (over 555 thousand Bq/m² caesium). For Byelorussia, these people are the priority in terms of relocation. □

Fuel shortages in southern Africa have been little helped by traditional approaches to solving the problem. DAVE SPENCE, a Development researcher, proposes Sustainable Development, embracing local culture and circumstances, as the way forward.

Sustainable energy development

ENERGY, environment and development are intimately linked. However, in the decades following independence in southern Africa, international agencies and governments followed a sectorally divergent approach to development. Colonial powers rarely prepared people for taking control; indigenous agriculture was totally altered by the colonialists. Several states were still faced with years of armed struggle. One of the greatest failures has been backed by the rich countries of the North - 'development'. All the 'experts' and the millions of dollars should have amounted to more. All approaches from 'trickledown' to the socialist communal farming have smothered a highly sophisticated set of relationships, hiding the real clues to development, at best producing poor results, at worst adding to the disruption.

The traditional institutional approach was totally inadequate. The 'energy problem' for example, with the focus on the supply-side, at first appeared simplistic, then later intractable. Today the answer is in Sustainable Development: an approach which sees energy problems, not in isolation, but closely tied to food production and manufacturing problems, ie. the inevitable consequence of perpetuated poverty. As Krause puts it, "In order for development to be sustainable, it

should foster the most complete human development possible of all people, and provide a surplus of the means of subsistence at a level compatible with the maintenance of the environment."⁽¹⁾

Sustainable development requires that people have control over their own resources and, as such, highlights the inadequacies of conventional intervention, and shows the complexities involved in a new approach. A sustainable approach seeks to take account of cultural, environmental, institutional and economic characteristics as well as the technical considerations.

Such an approach may appear very long-winded given the gravity of the situation in Africa, difficult to control and difficult to measure. However, fuelwood projects that have adopted this approach over the last decade tend to validate its use. Before looking at this new approach it is worthwhile examining the African scene.

Biomass in Africa

Biomass is more than wood. It includes the husks from crops, shells from ground nuts, animal dung etc. Ordinarily, these resources satisfy important roles: dung is used for fertiliser, seeds provide fodder. Trees satisfy a diversity of uses - tools, construction etc. It is with these uses in

mind that they are managed. Only dead wood, gleaned from the forest floor or from tools and fences no longer required, is used as fuelwood. However, in shortage situations, necessity negates choice.

There are 60 million people in southern Africa (excluding South Africa) and there will be an estimated 100 million by the year 2000. Many of these people are highly dependent on wood for their energy needs yet trees are being used on a non-sustainable basis.

The characteristics of the over use of biomass vary greatly between areas. Most people rely on biomass for household energy needs - heating, lighting, cooking, etc. and as a social focal point. Wood constitutes four-fifths of all energy consumed but this ranges from 50% in Zimbabwe to over 90% in Tanzania. Within countries, regional differences occur with rural areas 99% dependent on wood for fuel, the urban areas using gas and some electricity. On closer examination differences within small areas emerge, for example, adjacent areas with similar socio-economic characteristics, weather etc., may show subtle differences in tree patterns.

However, such dependence exacts a heavy price under pressure. In some areas woodfuel shortages occur even though there may be as much as 30%

Project Stages/ Design Features	Project Characteristics	
	New approach	Traditional Institutional approach
1. Intervention	Indirect	Direct
2. Capital cost	Low	High
3. Technology/management	Multiple purpose	Single purpose
4. Output(s)	Multiple products	Single products
5. Activity	Immeasurable	Measurable
6. Environmental impact	Positive	(Negative?)
7. Niche	Integrated, diffuse	Firm project boundary
8. Objectives	Broad goals	Narrow goals
9. Group focus	Female and male	Male

Contrasting approaches to fuelwood interventions



tree cover on farms. In many areas women are experiencing increased difficulties in obtaining supplies and where fuel scarcity is serious, the effects are drastic. For some this means going without cooked meals and resorting to taking wood from the house itself. Food quality drops where nutritional food requires longer cooking time, compounding health problems. Fertiliser may be taken from the land for combustion. For others it means increasing amounts of time, walking with their children for supplies. Where more time is taken in collection there is less time spent in agricultural production or in education for both women and children.

It is important to note therefore that the wide range of patterns reflects the wide range of ecosystems, production methods, culture, experience and socio-economic make-up of different areas.

The traditional approach

Although much of Africa is based on a biomass economy the conventional approach could not identify with this. The traditional view suggested the simple and obvious problem of fuelwood shortage could be tackled by a direct approach to intervention based on the experiences and knowledge from countries of the North, emphasising the supply side.

With this perceived superiority of knowledge, it was possible to ignore other sources of knowledge, the local people themselves, and in particular those most affected by the problem, women. The assumption made was that members of the forestry service were 'expert' with respect to trees and that they were in the best position to instruct local farmers in the necessary improvements to rectify the situation.

The immediate response of aid agencies and governments was to advocate growing more trees. Under the imperatives of donor aid and in the

name of efficiency, results had to be rapid and easily measurable. Using established channels, the forestry service became the main enactor. Forestry personnel adopted a policing role protecting remaining forest to facilitate regeneration, but causing great friction with locals now excluded from major fuel sources. Indigenous tree species were replaced by faster growing exotic species. With this emphasis on forestry, trees grown on farms were never considered.

In the past, dead wood was self-collected from the forest floor, but this approach converted fuelwood from a free residue to a commodity, a further pressure exerted on those without money.

The approach breaks down totally given the scale of the problem. Forestry could not produce enough to meet the 30 million tonnes shortfall envisaged for the year 2000. To put the emphasis on other technical fixes such as plantations or improved stoves, in isolation is equally inadequate.

New perception

The new approach is more sympathetic to local people and their local ecologies and reveals a different picture and hence different solutions. Including considerations for end-use, it shows the full extent of the meaning of a biomass-based economy with trees and their produce as integral parts of the region's culture, economy and environment. Trees satisfy a multitude of functions and needs and are far more than merely a source of energy.

Given the important role biomass plays it is not surprising that local people have sophisticated production and management techniques when it comes to trees. Perhaps the surprising thing is that before they had been totally ignored. On farms in eastern Africa different species are found, some providing shade over the house, some providing fruit, possibly fodder. Others are used to delineate land. Elsewhere woody biomass (trees and bushes) and produce is used as fencing, as construction material, and for medicines. They are used as pesticides, to add to the nutrient status, to bind the soil or break the force of the wind. Indigenous tree species are frequently best suited to meet these needs.

However, not all indigenous phenomena are pointers to progress. In many areas trees delineate the land, specifically showing the extent of a man's land, a woman having no rights to cut nor plant a tree. In some areas the male may be away from home, working in urban areas for cash income for 6

months at a time, leaving the woman to run the family and farm but without the option of planting or pruning trees. Some women have to go through the social contortions of getting a younger brother to work the living trees. For her to do so would be an attack on the man's authority.

The irony is perpetuated when you consider how demeaning it is for the man to even consider the families fuelwood situation, for the wife must provide biomass for the hearth. Nor does it end at the level of the farm. A government worker (and paid jobs invariably go to men) collecting information for the energy sector from a farming area, will find it easy to chat with the men and a major social error to chat with women. As a result the important signals concerning the state of the regions energy requirements are not known by the authorities.

Conclusions

This example highlights the complexities of a development approach fostering sustainable development, influencing a diversity of elements all of which must be included in the equation. Munslow⁽²⁾ compares the two approaches (see table).

The basis for sustainable development therefore is in observing local methods already in existence, and asking indigenous people what their main concerns and interests are. By acknowledging the skills and knowledge of local people it becomes possible to enhance indigenous production methods. In this way the intervention is far more in-tune with the local ecology.

Of greater concern are the gender relations which separate the fuelwood issue from the people as a whole. Whilst changes to these relations will take time and are also for the local people to decide, it is essential that changes do occur.

This example clearly shows the level of disruption incurred, and the severing of local knowledge and skills from the environment from which resources are obtained. The new approach shows the energy issue to be one of many compounding eco-destruction and hitting human reproduction. It is complex but the only viable approach under grinding poverty. □

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1. *Energy for Sustainable Development*, by F Krause. Nairobi: Environment Liaison Centre; 1985.
2. *The Fuelwood Trap*, by B Munslow and others. Earthscan; 1988.

The new Czechoslovak Government seems to have chosen the nuclear option in their attempt to reduce fossil-fuel pollution, unlike former East Germany (SCRAM 80). While potassium iodate tablets are distributed in Austria and Czechoslovakia in case of nuclear disasters, western companies continue to sign nuclear contracts with the Czechoslovakian Government. SEBASTIAN KLINKE, a student of political sciences at Bremen University, reviews the Czech approach.

Keep taking the tablets

FOR the West European nuclear industry it is vital that Eastern Europeans increase, or at least maintain their present nuclear capacity. Otherwise the industry will be doomed to a slow death due to the lack of domestic orders. Western nuclear companies are bombarding the Czech Energy Ministry with offers to build nuclear plants. They are also desperate to develop 'inherently safe' reactor designs (SCRAM 74).

Since Western utilities are unlikely to buy these new designs until they have a proven track record, power station manufacturers need to seek test-sites for prototype plants somewhere else. Siemens/KWU appear to have found such a test site in the Czechoslovak Federal Republic (CSFR). They have signed a contract to build a 200MW heat-only nuclear plant, which will supply the Pilsen district heating network. It will be a pilot project for a new simplified reactor which can operate with steam temperatures and pressure levels well below those of conventional reactors. Once this £50-70m prototype reactor is built, Siemens/KWU will be eligible to apply for an operating license in Germany.

Pollution

Electricity generation in the CSFR is based on much the same fuel mix as in the former GDR: very inefficient and dirty fossil fuelled power stations and Soviet-designed nuclear stations. In his report⁽¹⁾ on environmental issues in Eastern Europe, Jeremy Russell stresses that "the way in which energy is acquired and utilised" lies at the heart of the ecological problems.

Lignite-fired power stations are the main producers of sulphur dioxide (SO₂) emissions in both the CSFR and eastern Germany. Although the CSFR is a net exporter of SO₂, it nonetheless suffers from an annual deposition of some 3m tonnes. This has a dramatic effect on the health of people living in the most polluted areas. For example, the general sickness rate in North Bohemia's polluted areas is from 2 to 12 times higher than elsewhere in Czechoslovakia. Allergic diseases in children grew tenfold between 1962 and

1982. 60% of all trees in Czechoslovakia are dying. SO₂ also has a severe impact on agriculture: the Government estimates that the economy loses \$100m a year as a result. Potato production can be as much as 60% below that in the least polluted area.

Apart from the more obvious particulate pollution and SO₂, carbon dioxide (CO₂) emissions in all East European countries are very high for their GNP. This is mainly due to inefficient combustion, the relatively high proportion of electricity generated by fossil fuels, and inefficient distribution and end use. Most CSFR coal fired power stations are only 25% efficient compared to 38% for similar plants in western Germany and 60% in Japan. The CSFR Government have promised to replace 9% of coal generated electricity with nuclear by 1995, in an attempt to cut CO₂ and particulate emissions.

Nuclear

In 1989 nuclear power provided 26% of electricity consumed. The Czechoslovakian Government predicts a 22% rise in electricity demand by 2000, which they intend to meet by increasing nuclear generation to 50% of consumption.

CSFR operates 8 Soviet-designed PWRs (VVER-440 Model 230s); half at Jaslovske Bohunice near Bratislava (Slovakia), the remainder at Dukovany (Czech republic). They are all the same reactor type as Greifswald-1 to -4 in eastern Germany, which are shut due to safety problems, in particular severe pressure vessel embrittlement (SCRAM 80).

Ilse Tweer, a specialist in material testing in Hannover, Germany, expects the same kind of vessel embrittlement to have occurred in the two oldest Czech reactors, Bohunice-1 and -2. A total of 1,523 incidents have been reported at these two reactors alone. In 1989 364 incidents at all 8 reactors were reported to the Czechoslovakian Atomic Energy Commission (CSKAE). Despite being given a clean bill of health by the International Atomic Energy Agency (IAEA) and Siemens, there is strong pressure from nuclear free Austria for the closure of Bohunice-1 and -2. The Austrian con-

cerns have been vindicated by safety reports from their own specialist team and Czechoslovakia's Atomic Energy Commission, concluding: "possibly planned measures for a reconstruction of the plant should not suspend the closure of the plant". The CSKAE also believe that operators at CSFR plants are no longer able to keep unsolved technical problems under control. A common problem is that operators cannot rely on the electronic control system. In April 1989, for example, the central computer system memory bank at Dukovany-2 failed. False alarms go off intermittently, with no guarantee of the system working when it should.

There is also the question of what to do with the 40 tonnes of spent fuel from the 150MW prototype heavy-water moderated, gas-cooled reactor at Bohunice, shut down following two near core melt down accidents in 1976 and 1977, which killed three workers. The 150 steel storage containers are corroding, irradiating the cooling pond water, and no one is sure whether the plutonium concentration of the cooling water will eventually reach the critical point and explode. Concern is also being expressed over the high level of contamination being found in the adjacent Dudvah River.

Future

Bohunice-1 and -2 are built near a geological fault and, according to a Government statement, the installed sensor system for 'scrams' after earthquakes is "unreliable, unsuitable and not up to the requirements for the rest of the security systems". As a result Ladislav Zachar, former security manager of the Czech Electric Society; Marilies Flemming, Austrian Minister of Environment; and Jiri Beranik, former CSKAE security manager, have called for the closure of Jaslovske Bohunice.

According to Slovak energy industry sources, there are plans to close down Bohunice-1 and -2 in 1995, instead of the projected 2003-2005. They hope the other two units, after backfitting, will be able to continue operating. To improve plant safety, work on 75 "repair projects" has begun, and is due to be completed by the end of 1992.

After strong protests from environmentalists against the planned site for another two reactors at Kecerovce (Slovakia) and internal struggles over other proposed sites, the Slovak authorities now seem to prefer the idea of replacing Bohunice-1 and -2 by building two more units there. Each reactor being between 600MW and 1,000MW and probably of Western origin.

However, 8 further units are already under construction. Half of them, being built at Mochovce near Levice in Southern Slovakia, are the more recent Model 213 VVER-440 reactors. Construction is expected to be complete by 1995. This reactor type, similar to Greifswald-5 to -8 which are under investigation in the former GDR, still lacks a proper containment structure around the pressure vessel and even "considerable safety improvements" are not expected to bring the reactors up to Western standards.

The remaining 4 units, under construction at Temelin, near Ceske Budejovice in West Bohemia, are of the most modern VVER-1000 type. The first two units are expected to be completed in 1994 and 1996, but the future of the final two units is in doubt following an announcement by Economics Minister Vladimir Dlouhy, at the end of January, that they would not be completed.

The CSAE agree with East German experts that this reactor type tends to suffer from core instability, but the IAEA, as usual, thinks some backfitting with western technology will solve the problem, despite the fact that the Germans appear to have concluded this would be totally uneconomic. As Czechoslovakia's nuclear capacity will soon exceed baseload demand (about 30% of total electricity consumption) Temelin-1 and -2 will be used for load following, something they have not been designed for, and which increases the danger of a positive reactivity coefficient (as happened at Chernobyl).

Enterprise

Contracts for backfitting Mochovce-1 and -2 with western instrumentation and control have already been signed with Siemens/KWU; also competing for the bid were Westinghouse from the US, Gelelac from France and an Italian/French consortium. Siemens, Westinghouse and Asia-Brown-Boveri (ABB) are also in a competition for a joint venture project with Skoda Engineering for nuclear plant safety technology. Westinghouse and Skoda have already agreed to co-operate in the production of turbines.

On January 14 it was announced that France and the CSFR had signed an

accord on modernisation of the Czech nuclear industry. Cogema, the French nuclear fuel and waste management company, will examine the possibility of reprocessing spent fuel from Soviet designed reactors, and advise on modernising a uranium mine near Prague.

Meanwhile opposition against this huge nuclear expansion programme is growing. The Lower Bohemian regional council has voted 68-15 in favour of a halt to Temelin-3 and -4. Though the vote has no legal effect, they called on the central Government to develop a long term energy strategy based on the views of international experts.

Plans

The lack of any long term energy plan seems to be the central problem. Although the idea of incorporating the environmental dimension into energy policy is prevailing, no method has been worked out. The Government wants to increase nuclear capacity, pay more attention to energy saving, start the desulphurisation programme and double hydro capacity by 1995. All this would lead to 100% overcapacity. Therefore, the Environment Ministry is opposed to a nuclear expansion, whereas the Economics Ministry is very much in favour, while the CSAE has proposed shutting Bohunice-1 and -2.

The Federal Economics Ministry has tabled a 70-page report to the Federal Government and the Czech and Slovak authorities, giving its view of the country's energy options. They suggest an additional 3,000-4,000MW of nuclear capacity. They argue that to construct other new generating facilities which meet "contemporary environmental standards", World Bank or other finance will be required. They appear to ignore the cost of completing construction, backfitting, reprocessing, waste storage and decommissioning.

Even without the pro-nuclear pressure being exerted by the Economics Ministry and the powerful newly created Economy Council, the task of keeping environmental issue on the agenda seems impossible in a country where consumers are demanding higher standards of living whilst unemployment rises.

Jeremy Russell's fear that "long term enhancement will be sacrificed for short term cosmetic or economic gains [and that] clean up targets will be incorrectly chosen or even missed altogether" is particularly true for the CSFR. No one seems to realise that the economic changes will lead to mass factory closures over the next five or ten years, while rising energy prices could lead to a large reduction in demand. This



decrease in energy consumption could provide a breathing space to either shut down or improve the existing power stations, build new energy efficient coal or gas fired power stations and expand the share of renewables, mainly hydro power. Obviously none of the politicians are much interested in telling this conflicting truth.

Prospects

The good news is that the Government are still quite dependent on favourable public opinion, so an increased public awareness of the dangers of nuclear energy, the many accidents in the CSFR's nuclear power stations, and the anti-nuclear stance of the Austrian government, will all increase pressure on them to change their policy.

Local authorities in Upper Austria have expressed their readiness to finance an anti-nuclear information campaign in Czechoslovakia. Austria's Economics Minister, Wolfgang Schuessel, has offered investment in renewables and Austria's Federal Chancellor, Franz Vranitzky, has offered the Prague Government sufficient electricity supplies if they would close down Jaslovské Bohunice-1 and -2, halt their nuclear expansion plans and to co-operate in developing alternative forms of generating capacity.

Former East Germany is showing how it is possible to replace highly polluting lignite-fired power stations and Soviet-designed nuclear reactors, with a modern power generating system, without resorting to nuclear power.

The bad news is that the CSFR Government appear to be committed to a nuclear expansion. While the CSFR Green Party are unable to unite in opposing a nuclear fix, the prospects for a nuclear-free future remain as unlikely as a communist revival. □

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1. *Environmental issues in Eastern Europe: setting an agenda*, by Jeremy Russell. Royal Institute of International Affairs, London; 1990, 34pp, £10.

If the Government's renewable energy review being undertaken this year is to appreciate the full value of these energy sources it will need to be much more wide ranging than is expected. MIKE HARPER, Friends of the Earth's Assistant Energy Campaigner, argues that environmental issues need to be fully considered.

New energy review

THE Government's White Paper on the Environment (*This Common Inheritance*) announced that in 1991 there would be "a fundamental review" of its strategy for encouraging the use of renewables. In the House of Commons, it has been stated that the review will cover "methods, resources and criteria for support"⁽¹⁾ of renewable energy technology, including funding, research, and measures for 'market stimulation'. A group to oversee the review will be chaired by the Minister for renewables, Colin Moynihan. It is, in effect, an update of the last Government policy paper on renewable sources of energy, *Energy Paper 55*⁽²⁾. The scale and scope of the review suggests that the Government is, at least, prepared to undertake a thorough evaluation of what constitutes the best next step for promoting renewables in the UK.

Friends of the Earth believes that the optimum way in which current UK policy on renewables can evolve is through taking such environmental considerations as global warming fully into account when promoting renewable energy.

Aiming too low

If this were to happen, then the "challenging target" for developing renewables set by the Government in the White Paper would be more than three times its current size of 1,000MW by the year 2000⁽³⁾ and should be approaching 3,500MW. The Government's own target comes as a conclusion to the section on renewable energy in the White Paper. The preamble to this section extols the virtues of renewable energies, concentrating particularly on the fact that increasing the use of renewables is desirable on environmental grounds. One could therefore be forgiven for thinking that the target represented some sort of response by the Government to the environmental problems outlined in the White Paper. It is not. The full integration of environmental considerations into UK energy policy on renewables does not happen at the moment.

Energy Paper 55, published in June 1988, represents the last official statement of renewable energy policy for the UK. Back in 1988, the promotion of renewables was considered appropriate for one main reason - diversity of fuel supply: "In an uncertain world we need to make use of all available sources of energy to provide diversity of supply" (page 1).

This is still current policy and therefore, even today, the quest for 'diversity of supply' forms the driving force of renewable energy policy. Policy at that time was determined by the Government's desire to reduce the UK's dependence on domestic coal supplies for use in electricity generation.

Insurance Policy

Of secondary importance, renewables are considered to have value because they can act as insurance against interrupted fuel supply ("in the event of an unforeseen disturbance in conventional supplies") and they reduce the environmental impact of conventional technology.

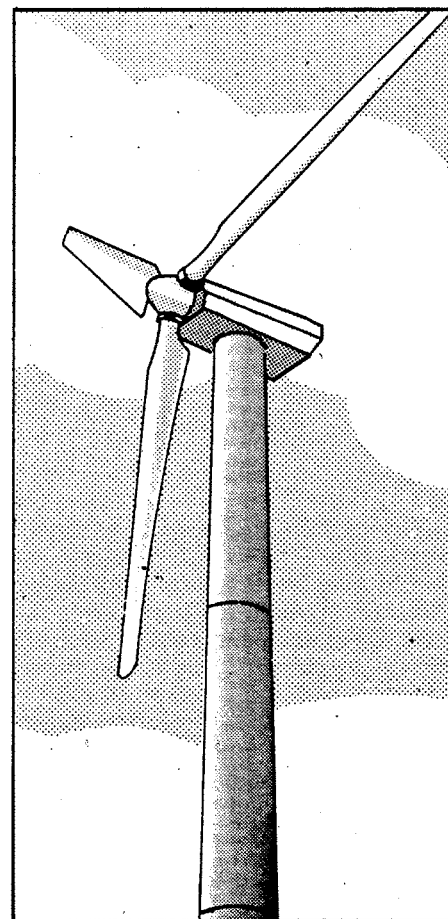
The active promotion of renewables, therefore, justified principally on environmental grounds is not yet official UK policy. Making it official policy is the most logical 'next step' for energy policy development. This is particularly so given that the renewable energy review follows the Government's declaration that it is committed to stabilise national carbon dioxide emissions at 1990 levels by 2005. It is also the most important next step in terms of environmental protection, since it begins the essential process of integrating environmental policy into energy policy.

A three fold increase in the current 'target' would emerge if the Government's renewable energy policy was based on the need to develop appropriate response strategies to global warming. FoE suggests a target of 3,525MW!

To some, renewable sources of energy will never have a significant role to

play in UK energy policy. Their battle cries are now all too familiar: "uneconomic", "what about the public opposition", "the technologies are not yet sufficiently developed". But, are they valuable criticisms? Yes and no. The obstacles exist, indeed; but so do the instruments needed to overcome the obstacles. It is therefore imperative that the forthcoming review should ensure the removal of the obstacles.

Firstly, on economics, the commercial viability of any project is determined by a host of variables and factors which constitute the 'economic environment' in which the project has to operate. One obvious example of a factor affecting the 'economic environment' is the issue of whether energy sources reflect their full environmental impact (eg. carbon dioxide emissions for fossil fuels, radiation and decontamination following an accident for nuclear power). If the objective for the



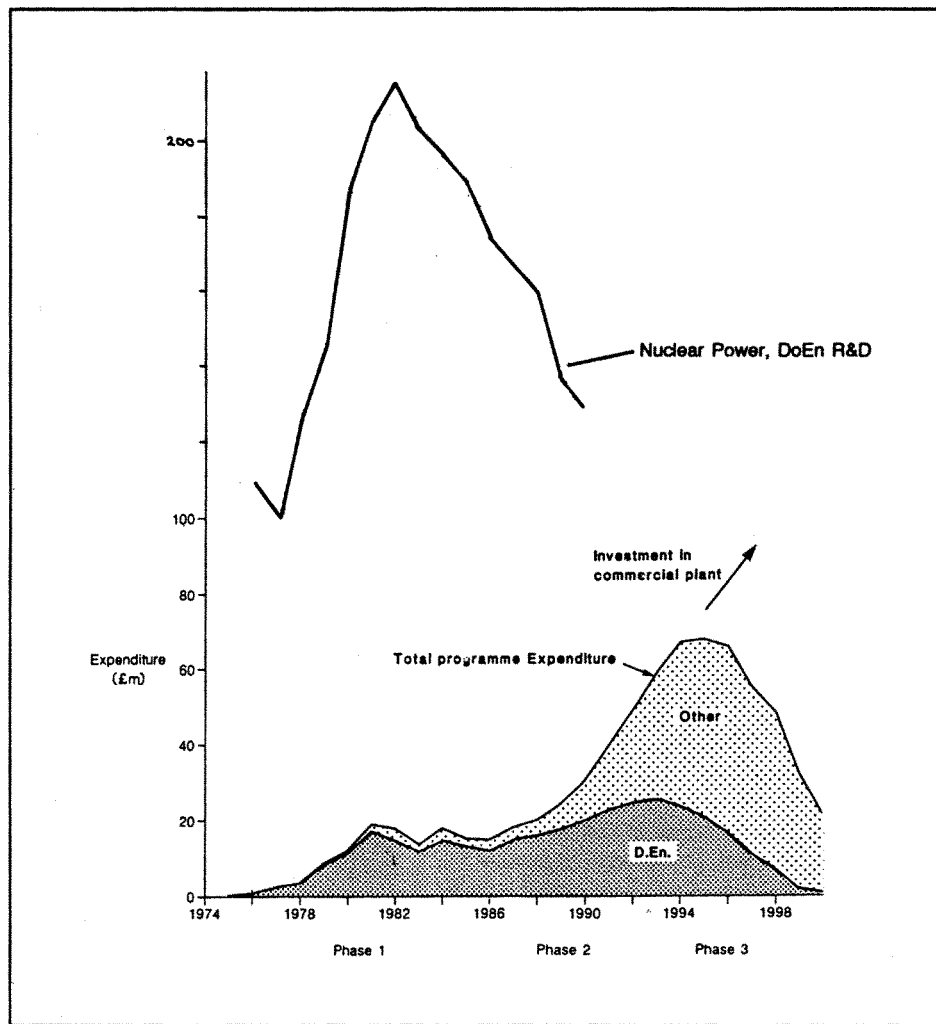
Government is to formulate strategies for developing renewables to serve as an effective response to global warming and other environmental concerns, it cannot but recognise the need to consider the significance of these external factors and to address them as an issue in itself. The review therefore needs to consider how to ensure that assessments of commercial viability do not continue to ignore the environmental benefits which derive from supporting renewable energy.

Economic pressures

In many ways the two criticisms of public acceptability and technical immaturity are also functions of the 'economic environment'. Concerning the former, the perceived and real environmental impacts which arouse public opposition are aggravated by the need to maximise revenue to meet financial criteria determined by external factors. For wind energy, for example, there is an economic pressure to secure sites with higher wind speeds than is demanded by the technology itself. Sites with higher windspeeds tend to be sites with higher landscape value. The current economics of siting windfarms precludes sites under 8m/s from being seriously considered. This not only eliminates a large potential for wind energy but constrains wind development to more sensitive areas.

By removing the economic requirement to site wind farms at high windspeeds, pressure on the more sensitive sites is also removed. It is important for the review to recognise and respond to the fact that the 'economic environment' plays a critical part in determining the acceptability of projects.

In the same way, concerning technical maturity, the rate of technical development of individual sources depends critically on the perceived rewards for successful development. If the emerging market signals are seen to be insufficient, technical development stumbles and ultimately grinds to a halt. In the absence of public research subsidy on the scale of that lavished (and wasted) on the nuclear industry (greater than £16 billion to date), commercial research will only emerge if the perception exists that there will ultimately be a market for renewables. Again, therefore, the 'economic environment' affects the technical development. The review must be capable of



Department of Energy Renewable Energy programme RD&D expenditure⁽²⁾ and Department of Energy Nuclear Power R&D expenditure

ensuring that the market signals given to potential developers provide sufficient long-term incentive to encourage active participation.

The 'economic environment' itself should be a central focus for the forthcoming review. A first step in addressing this issue would be the immediate return to the European Commission seeking an extension of the 1998 limit to protected prices under the Non Fossil Fuel Obligation – a step which FoE has been told would be well received by the European Commission.

The review will not however be complete unless it addresses the other barriers to renewable energy deployment:

- The formation of common standards for emerging technologies;
- The publication of planning guidelines for renewable projects (the lack of such guide-lines is contributing to the rough passage some wind projects are enduring in seeking planning permission); and,

- The creation of an effective, well resourced and independent agency capable of co-ordinating the translation of available and proven technologies into operating technologies.

Government renewable energy policy reviews are of paramount importance. They are not frequent, yet they establish the aims and methods for developing renewables for years hence. The environment cannot afford to miss this opportunity for ensuring a logical and necessary development of current renewable energy policy which is grounded in the protection of the environment. □

Notes

1. The statement was given in a written answer to Mr Flynn, MP, on 25 October 1990 (Hansard Col 275)
2. Energy Paper 55, *Renewable Energy in the UK: The Way Forward*, 1988.
3. "The Government will work towards a figure of new renewable electricity generating capacity of 1000 megawatts in 2000." *This Common Inheritance*, page 72.

Skye Barrage

PLANS to build a tidal barrage over the sea to Skye instead of the Government's proposed toll bridge are gathering considerable support as objections to a bridge become more and more vociferous, writes Dave Spence.

Peter Findlay, a retired Lothian engineer, believes his barrage would bring environmental, economic, social and technological benefits to the region and beyond, as well as improving transport links.

Existing bridge plans have upset a large number of people. With completion of the bridge, the ferry tender would be withdrawn by the Scottish Secretary. Many locals feel this will seriously curtail choice especially since the bridge route would by-pass Kyleakin, the first settlement and landing stage on Skye. Even executives of Caladonian MacBrayne (the company operating the ferry, who are coincidentally owned by the Scottish Office) believe the closure would not be based on sound commercial judgement since the ferry could compete successfully.

Objections have also been raised by environmental and amenity groups including the National Trust for Scotland, the Countryside Commission and the Fine Art Commission. Of major concern is that a structure, with a 30 metre road-level clearance above high water level, will detract from the spectacular views of the Cuillins. The Association for the Protection of Rural Scotland even suggested a tunnel!

Findlay argues that apart from causing less spatial and visual disruption, the barrage would save the equivalent of 90,000

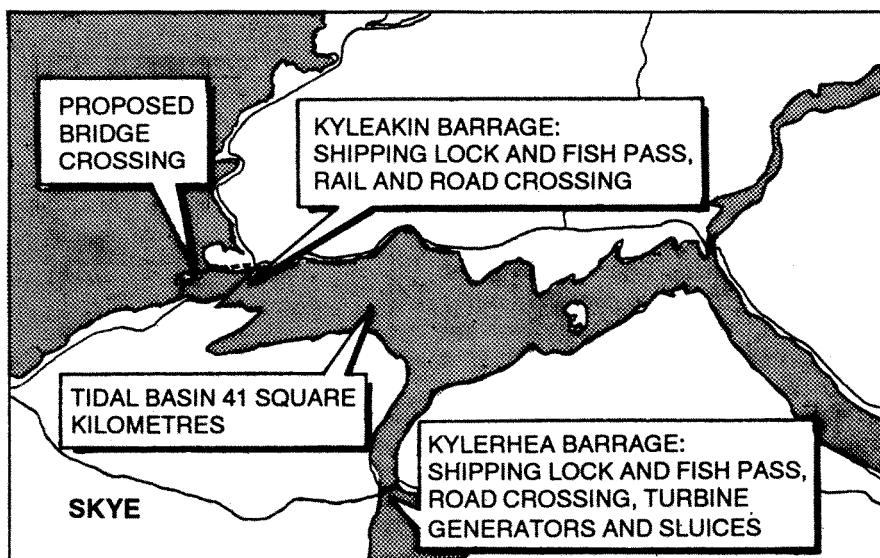
tonnes of coal and reduce carbon dioxide emissions by 20,000 tonnes a year. Other advantages include the creation of up to 2,000 person-years of employment, a yachting haven and provision for a possible extension to the railway. He also argues that it is an ideal pilot project before going on to larger schemes such as the Severn. An obvious attraction for locals is the generation of cash for the region.

The plan, is for two crossings. The first from Kyle of Lochalsh to Kyleakin would form the transport corridor, possibly including a rail link. The second, from Kyle Rhea to Glenelg would be a barrage with ten megawatt turbines providing an annual energy output of 135GWh - more than Skye and Western Isles demand combined. "It would cost much less than a bridge," explains Findlay, "much, much less. I would say half the price. And, it would have hardly any visual impact. A

causeway at water level, will simply be a line running across the water."

Unfortunately, Findlay's barrage was a late starter and opportunities for further assessment are fast running out. The Scottish Development Agency, whose remit includes the promotion of 'green' projects in industry, knew nothing of the barrage proposals when contacted by SCRAM. In answer to a question from Brian Wilson MP, Lord James Douglas Hamilton, Scottish Office Environment Minister, said that any study is the concern of the electricity generating industry, adding that plans for the construction of a bridge will not be delayed. A decision between the three bridge proposals is expected at the end of this February. □

* An article by Peter Findlay, on the Skye Barrage proposal, will be published in a future issue of SCRAM.



Furness Barrage

PROPOSALS to build a 3 mile electricity generating barrage across the Duddon estuary in West Cumbria are meeting with fierce opposition even before a feasibility study has been carried out.

While the Government are considering a funding application for the £180,000 study from Sir Robert MacAlpine and Balfour Beatty Projects, an impressive array of environment groups including the RSPB, the Nature Conservancy Council, Friends of the Lake District, the Cumbrian Wildlife Trust and the National Trust are preparing their case against.

At a cost of £128 million the barrage would produce around 120MW of power, however, it would irrevocably

change the nature of the estuary. The environment groups are quick to point out that the estuary, immortalised by Wordsworth: "Majestic Duddon, over smooth flat sands, Gliding in silence with unfettered sweep!", is one of "Britain's last true wildernesses".

The RSPB have told the companies of their "grave concern". They liken the estuary to a motorway service station for "thousands and thousands of birds that come from Siberia, Iceland, Scandinavia and Canada". The Duddon is vital to their survival in winter, it serves as a stop over on the way south.

Mike Houston, secretary of Friends of the Lake District, speaks for all of the opposition when he comments, "We favour alternative technology, but not at the expense of damaging the environment and the beauty of the estuary." □

Brussels wave

EUROPEAN Commission vice President, Filippo Pandolfi has apologised to the European Parliament for 'misleading' it over the results of a study into the potential of wave energy in the Community (SCRAM 80). He also announced a 1.2 million Ecu (about £860,000) wave energy study.

Pandolfi apologised personally to Llewellyn Smith MEP, who was told a 1985 Commission report "confirmed that it would have been premature to start demonstration in this field". In fact that study recommended a programme of research costing about 13.7 million Ecus.

Smith welcomed the apology, however, he told the Par-

liament "it still seems more than a coincidence that this act of deception followed a similar one by the British Government on wave energy." (SCRAM 79). He added, "We all know that it is not just a question of wave energy but about protecting the nuclear industry."

Many observers believe that the Commissioner's 'misleading' statements stem from pressure applied by the British Government, whose attitude to wave power since 1982 has been far from supportive or rational.

Winnie Ewing MEP, who is evidently party to this theory, has convinced the Commission to make public all correspondence between themselves and the British Government on the subject of wave energy. It should make interesting reading. □

Cornwall geothermal

TEN years of pioneering research work into Cornwall's potential for geothermal power, costing over £30 million, have come to an unhappy conclusion. It is believed that the Government will shortly announce the closure of the project based at the Camborne School of Mines at Rosemanowes.

Roger Parker, Director of the project which employs 60 people, said he had not yet been told of any decision to axe his

project. However, he did concede that the hot dry rock (HDR) method being explored at Rosemanowes was proving to be around 4 times more expensive than estimates for wind or wave energy.

The HDR technique involves drilling two bore holes to a depth of several kilometres, where the mass of hot rock lies, and then creating artificial fissures to join the two bores. Cold water is then pumped down one of the bores, it passes through the hot rock area picking up the heat, which it delivers to a heat pump at the surface.

According to the Government the Cam-

borne well had the potential to provide between 750 and 3,000 TWh of electricity, enough to satisfy "the South West into the foreseeable future." It was this vast potential that prompted so much money to be spent, however, the technical difficulties and high costs of drilling bore holes to depths exceeding 5km and then creating the fissures are, for now, apparently insurmountable.

HDR geothermal technology, it appears, will be demoted in the Government's renewable energy league to the third division - "long shot". □

Green con

CLAIMS that using more electricity in the home helps to fight global warming have won Eastern Electricity, one of the newly privatised area electricity boards, the unprestigious Friends of the Earth (FoE) 'Green Con Award'.

In a letter to over 1,000 of its customers, signed by the chair James Smith, the Board explained that "... you should consider using more electricity rather than less. The advantage is that there is very little CO₂ or global warming gas emissions from an all-electrical home." While this may be true, the letter completely ignores that fact that electricity generating stations are the greatest contributors to

global warming.

FoE's chair, David Gee, described the letter as "outrageous, a green con of the highest and most sinister order." He hopes that the annual award of the green, Janus-faced, trophy would encourage people to look beyond the simple advertising hype and examine all the processes involved in the products they buy - the so-called cradle to grave approach.

Last years winners, British Nuclear Fuels, the first recipients of the award, say they were surprised to hear that FoE had only loaned them the tasteful artefact. The trophy is recyclable, BNF say: "We never asked for such a dubious object in the first place. We were never told it was on loan and we certainly don't intend to pay the cost of a Red Parcel service to return it." □

Dutch coal

IN the first case of its kind, in Europe, a private company has forced the Dutch government to reconsider plans to build a 600MW conventional coal-fired power station at Maasvlakte near Rotterdam.

Texaco won the case brought before a Dutch industrial tribunal on the grounds that the Dutch economic affairs minister, Koos Andriessen, had failed to adhere to the 1985 European Community directive. The tribunal placed a restraining order on the Government saying that the state should have conducted an impact assessment before deciding to build the plant.

Texaco believe that once this process is carried out then a Combined Cycle Coal Gasification Plant (CCGT), such as the one already proposed by Texaco for the area, will shine through on environmental grounds. Andriessen, however, argues that the technology is not commercially proven. Texaco counter: "We know that the technology is feasible as more than 5 million tonnes of coal have been gasified in commercial plants world-wide."

Indeed, their own plant in Daggett, California, has gasified 1.1 million tonnes to produce 2.7 million MW of electricity since coming on stream in 1984.

Ed Grerstbrein, Texaco's Technical Director, argues: "Power plants running on CCGT have very obvious environmental benefits over conventional plants. As far as the problem of global warming is concerned, plants running on coal gasification are at least ten percent more efficient and therefore produce one-tenth fewer emissions of carbon dioxide." Nitrous oxide and sulphur dioxide emissions - the main acid rain gases - are 90% lower.

The Dutch Government's approval for the coal plant also contradicts its own and much vaunted National Energy Plan: "Environmental protection calls for a policy which discourages the use of coal for generating energy in industry ... research into coal gasification will be encouraged." □

Icelandic Imports

BRITAIN could be receiving clean power from Iceland by the turn of the century at a cost lower than home-grown nuclear or fossil fuels, according to researchers from Glasgow University and Iceland's National Power Company (NPC).

A four year feasibility study concludes that costs of between 1.9p and 2.5p/kWh could be achieved for power, generated in Iceland, delivered to the south of England. The power would come from new geothermal and hydro electric plant and would therefore contribute nothing, or very little, to air pollution. Indeed it is being promoted as a good way for the UK to meet its target of freezing carbon dioxide emissions by 2005.

Iceland, with a population of only 250,000, currently uses a mere 8% of its geothermal and hydro resources and is keen to exploit its massive reserves for export. Around 6GW of economic clean power is available. However, the plan is based on 2,000MW transported to the north of Scotland via for sub-sea cables. NPC say that although the cable will be by far the longest ever laid under the sea it will not be a problem as power cable technology has improved to the point where "it is just as reliable as conventional generation."

From Scotland a 2,000MW high voltage direct current link would take the power south. It is thought that the first 500MW of Icelandic power could be delivered in 7 to 10 years, 1,500MW could be supplied before 2010 and about 2,000MW could be developed by 2010-2015.

While Dr Tom Hammond of Glasgow University doesn't expect that there would be much opposition to the new generating plant in Iceland, it is unlikely that overhead cables would be built without a public inquiry.

Although, after about 25 years the cost of the electricity will plummet, as the capital costs for the generating plant will have been paid of, it is not certain if it would be possible to raise the 2.5 billion costs of the scheme entirely from the private sector. However, as Iceland stands to gain an extremely lucrative export market, Agnar Olsen, head of engineering with the NPC, believes that his Government will provide some backing.

This is not the first time that the idea of using Iceland's vast alternative energy resources to power England has been proposed, however, in the past plans always floundered because of a lack of political will. This time, it is hoped, the need to reduce atmospheric pollution may just tip the balance in the schemes favour. □

US renewables

PUBLIC Citizen (PC), the influential American pressure group on consumer and environmental affairs, has launched a campaign called *A Sustainable Energy Future* which is being backed, so far, by 115 national and community based organisations, representing over 4 million members.

They believe that the war in the Gulf is an inevitable consequence of an energy policy based upon foreign oil, and that the US must "wean itself from oil imports". They warn that if this dependence continues then further 'oil wars' are inevitable as the US will be forced to fight for "unstable oil supplies."

Three basic principles dominate their proposed energy policy*:

- 1) the US must give priority to those energy options with the lowest total economic, environmental, and social cost.
- 2) the US must avoid energy technologies that are particularly hazardous to the local or global environment or to human health.
- 3) the US must minimise the use of energy imports to avoid economic disruptions and to protect national security.

A Sustainable Energy Future is broken down into 4 main goals. Energy efficiency, predictably, "should be the cornerstone of the nation's energy policy." Over the last 15 years the economy has grown by almost 40% while energy consumption has remained about the same. This, believe PC, underlines their belief that "through improvements in energy efficiency and common sense energy conservation measures," a cut in energy consumption by 25-30% is possible by 2010.

Today renewable energy sources provide 10% of the US's domestic energy production and nearly 13% of its electricity. Costs for most renewable energy technologies have dropped dramatically over the last decade while efficiency has improved. PC believe: "Today, many renewable energy technologies are cost competitive with, if not cheaper than, new oil, coal, or nuclear facilities." Other options such as photovoltaic cells, whose costs have plummeted 75% since 1980, are expected to be cost-competitive within the next 5-10 years. They are arguing for "at least" a doubling of the contribution from renewables by 2000, and then double again by 2010: "so that renewable energy provides at least 50% of the US's energy supply."

Natural gas should be used as an interim fuel while reliance on coal and oil should be reduced. They acknowledge that natural gas is not exactly a clean fuel, however, it is relatively clean when compared to coal and oil. They call on the Government to "reduce the projected use of coal and oil by at least 50% by the year 2010, using natural gas as a bridge fuel during the transition towards cleaner, sustainable energy sources."

Nuclear power has no role to play in PC's energy strategy. "Since 1980," they point out, "the construction costs for nuclear power plants quadrupled while operating and maintenance cost for existing plants increased by more than 10% annually, despite extensive federal support." As for new designs PC believe they are amongst the most expensive option for generating electricity. They conclude the US should, "build no new nuclear reactors and accelerate the retirement of existing plants as nuclear power is replaced by safer and more economical energy sources." □

**A Sustainable Energy Future - principles and goals for a national energy strategy.* Available from Public Citizen, 215 Pennsylvania Ave. SE. Washington DC 20003.

Hot news

GLOBAL warming took a step closer to reality last year; 1990 was the warmest year since reliable records began 140 years ago.

David Parker, a senior researcher at the Meteorological Office's Hadley Centre for Climatic Prediction, comments: "We cannot prove that this is the man-made greenhouse effect we're seeing, but

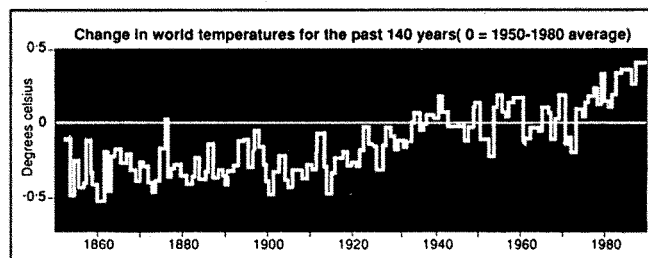
it is likely - more than a 50% chance." His collaborator, Phil Jones of East Anglia University's Climate Research Unit, in compiling the annual update of world temperatures, said "The evidence is becoming stronger year by year, but there will still be people who are sceptical."

Six of the seven warmest years on record have occurred since 1980. They are, in order with the warmest first: 1990, 1988, 1983, 1987, 1944, 1989

and 1981.

The figures have been compiled from statistics collected at over 1,000 recording stations on every continent and

about 1 million readings at sea, and are borne out by those produced by NASA's Goddard Institute for Space Studies in New York. □



A hard rain is going to fall

A new report* from Friends of the Earth (FoE) claims that the Government is failing to meet international commitments to reduce the emissions of acid rain gases because of privatisation.

The report by Dr Jim Skea, a Senior Research Fellow with the Science Policy Research Unit at the University of Sussex, shows that Britain's programme "lags 10-20 years behind that in the US, Japan and Germany." It also asks why the Government's own research into reducing emission of nitrogen oxides (NO_x) from fossil-fuelled power stations has not yet been published when it was received by Environment Minister David Trippier last year.

The new research also reveals that stepping up the programme to reduce NO_x emissions, or making power station operators in Britain reduce sulphur dioxide

(SO₂) emissions in line with the action being taken in most European Community countries, would cost the equivalent of only 1% on UK electricity prices.

Britain will reduce NO_x emissions by only 30-40% because it is relying on outdated technology say FoE.

If 8,000MW of plant were fitted with Selective Catalytic Reduction (SCR) instead of low NO_x burners as currently planned "then NO_x reductions of an additional 20% or so could be secured by 2010." They believe that the unpublished Government report is likely to "draw favourable attention to SCR and other effective de-NO_x technologies." Indeed SCR is already widely used on the continent. For example, it is to be fitted to over 33,000MW of plant in Germany where NO_x reductions of 74% are expected to be achieved by 1993.

A 20,000MW programme of flue gas desulphurisation would avoid the need for coal imports by the mid 1990s they say. It

would also reduce SO₂ by a further 50% by 2005 compared with the current programme, costing an equivalent of a further 3% on electricity prices.

FoE are also awaiting the outcome of a complaint they lodged with the European Commission over the UK's failure to adhere to a Community directive which calls for plant to be upgraded to the Best Available Technology Not Entailing Excessive Cost (BANTEEC).

Fiona Weir, FoE's air pollution campaigner, comments: "The British Government has a responsibility to invest in modern technology to clean up air pollution caused by our older power stations. But the profits of privatisation are being given precedence. We have asked the European Commission to take action." □

* *Acid emissions from stationary plant: re-opening the debate*, by Jim Skea. Friends of the Earth; December 1990, 80pp, £15.

Swedish alternatives

SWEDEN is planning to spend 3.8 billion krona (£352m) on developing alternative energy sources and improving energy efficiency over the next five years.

While renewing their commitment to phasing out nuclear power by 2010 (see page 6), they have decided not to push ahead with plans to start closing the first reactors in 1995, but to wait until alternative sources of power are proven.

Nuclear power produces around 50% of the nation's energy supply. The problem of phasing the industry out is exacerbated by Sweden's commitment to freeze emissions of carbon dioxide at their 1986 le-

vels from 2010. Peter Asell, the energy adviser to the industry minister, argues "If we could have replaced the nuclear power with natural gas, we could start closing nuclear plants in 1995."

Asell says that the money will be split to cover three areas, 1 billion krona for energy conservation, 1 billion krona for biomass and the remainder will be spent on other forms of renewable energy.

Sweden has already spent a great deal of money on researching alternative energy sources which according to Asell they now want to turn into "real things". Last year the Government sponsored a competition among companies to develop a domestic fridge-freezer that uses no CFCs and runs on 50% less energy than current models. The competition was won

by Electrolux. Asell says the timber industry could produce some 50 terawatt hours of power. Sweden already has a number of small steam turbines which produce both electricity and heat from wood chips, however, in order to increase the ratio of electricity produced the wood must be burnt more efficiently. Asell believes that a gasification process would be most promising but admits that pressurised fluidised bed combustion is an alternative.

Every January the Swedish parliament will review the country's progress and decide when it might be possible to start running down the nuclear reactors. "Lots of people think we won't be able to stick to the plan to phase out nuclear power by 2010. We are convinced that we can." □

Cold shoulder

COLD fusion scientists Stanley Pons and Martin Fleischmann have been asked to pack their test tubes and leave the University of Utah's Cold Fusion Institute.

Pons and Fleischmann, who first hit the headlines when they claimed they had achieved nuclear fusion in a test tube, at room temperature, and then hit the headlines again when they couldn't repeat the fabled result, have been with the institute since its inception in 1989.

Considerable scepticism has surrounded the pair, which has not been helped by the fact that they refuse to cooperate with fellow scientists by sharing the results of their research. The state, which funds the institute, has now ordered them to surrender their notebooks. Fritz Will, the institute's director, said, "Pons and Fleischmann have not been accountable to the institute, its directors, or the board. It has not been an amicable relationship."

Will, although not entirely confident that cold fusion has been achieved, believes that nuclear evidence - neutron emissions and tritium by-products - exists for something "that clearly does not fit into the realm of traditional

nuclear physics."

Pons, however, is not about to give up. In January he requested that the University give him new status as a 'research' professor which would free him from his more mundane teaching and administrative duties. Recent developments, says Pons, "require an even greater commitment of time on my part to explore and develop the technology" of cold fusion. As yet he has produced no evidence to support his new status. □



Pons (left) and Fleischmann

Willow power

ELECTRICITY generated from willow trees could meet about 6% of the UK's annual demand for energy according to researchers from Bristol University's Long Ashton research station.

Dr John Porter, head of the research team, believes, "that energy production from willows is becoming a more and more valuable option in the light of the current energy demands."

He points out that the intensive farming of willows for energy would offer farmers a valuable source of income from land set aside while there is a surplus of bulk food in the European Community.

Young shoots would be harvested from the densely spaced willows every 5 years and turned into fuel chips. These chips could then be used to drive conventional steam turbines or they could be gasified and used to drive generators.

Not only are willow combustion gases low in sulphur and nitrogen oxides but the trees absorb as much carbon dioxide when they are growing as they release when burnt. □

Energy deficiency

INVESTMENT in energy efficiency has gone into a serious decline despite continuing Government rhetoric extolling it as the quickest and cheapest option in combating global warming.

According to the Association for the Conservation of Energy (ACE) there has been a 28% fall in spending on efficiency measures over the last 2 years. Based on trade association reports, the figures produced by ACE show that investment in cavity wall insulation has dropped by 8% since last year and 49% since 1988; double glazing fell 11% on

last year and 34% on 1988; heating controls are down 8% on last year and 20% on 1988; and boilers and radiators are down 13% from last year and 25% on 1988.

Andrew Warren, the director of ACE, describes the situation as "ghastly", saying that we are doing exactly the opposite of what the Government implied in its White Paper on the environment. Adding, "the market for energy conservation goods and materials is being decimated. If we aren't introducing energy saving items into our homes and offices now, we can stand little chance of cutting back our profligacy and pollution."

ACE want a radical overhaul of the UK's approach which will back the rhetoric with action, the policies they want adopted include:

- A range of new grants and incentives to encourage energy conservation, in line with events in other European countries over the past 2 years.
- The abolition of value added tax upon energy conservation equipment (VAT is not charged against energy supply).
- An effective energy labelling system for both appliances and buildings.
- Replacement of the Government's Energy Efficiency Office by an independent agency, with a far larger budget. □

REVIEWS

Green Warriors; by Fred Pearce.

The Bodley Head; 1991; 331pp; £14.99.

In *Green Warriors*, Pearce looks at the larger environmental groups, their tactics and strategies. Touching on most of the perspectives he lays open the blind alleys, the embarrassing gaffes and the tangible results of campaigns that have brought power and influence.

The danger of creating a 'Who's who' is avoided through Pearce's anecdotal style which makes the book highly readable and brings out something of the creativity and energy of environmental campaigners.

Early chapters are semi-biographical concerning the main players of groups in the 60s and 70s. Topics cover most of the campaigns, from radioactive waste discharges

and whaling, to recent issues of debt-swapping (exchange of non-retrievable bank debts for conservation measures) and ecological societies of Eastern Europe as progenitors of political change.

However, Pearce improves when tackling the disastrous policies of conservation oriented groups and influential global institutions in their dealings with the South. He vividly contrasts the western dominated policies and their culturally derived views of nature, with the people centred activism of Chipko, rubber tappers and others.

The emphasis on environmentalism in developing countries is important. Not

only does it put northern Green Warriors into perspective, it is also important because people in the South, for reasons not of their own making, will be readily judged for their contribution in re-stabilising ecosystems. In many examples Pearce reveals how it is in the South that "the spirit of environmentalism is at work". It is also fundamental to solutions on energy issues for the majority of the worlds poor.

Specific energy interests are covered in exposing the World Bank and Japanese banks, who in spite of the evidence, continue to recycle their huge trade surpluses into 'mega-projects' such as dams and power stations. Their attempts to adopt a greener hue also come under the microscope.

Changing the banks views is a serious task for both the environment executives and the people of the South. It is

important that the banks make available energy efficient technologies in developing countries "without creating the erroneous impression that the nations are currently responsible for more than a small fraction of the problem."

The final, 'Futures', chapter on the greenhouse effect and the privatisation of land and genes is chilling and to the point: "we may have to rely for our survival not on nature but high-security gene banks - not on the instincts and knowledge of millions of farmers, but on the patented and licensed expertise of a few scientists working for giant corporations."

This is one of the better books in the ecology section especially for newcomers, bamboozled by environment issues. Give such a friend a copy, but read it first.

DAVE SPENCE

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REVIEWS

Dirty Words – Writings on the History and Culture of Pollution; edited by Hannah Bradby.

World Wide Fund for Nature & Earthscan;
1991, 166pp; £6.95.

This is not the first time we have felt under threat of environmental catastrophe. We need, according to Bradby, to place our daily worries in a historical and cultural context.

The exploitation, she observes, has been developing since life first evolved: "When our own era is set in its proper context, we are better able to see which trends are unprecedented and to judge the degree of importance that should be given to events." However, given the books intent to place things

in context it is irritating that there are no biographical details on the contributors.

Among the essays, all of which are interesting and thought provoking, the most entertaining was written by Walt Patterson, who will be familiar to many SCRAM readers. In his short essay entitled Environmental Troublemaking he manages not only to amuse but to be encouraging. A seasoned campaigner since the late '60s he seems immune to the cynicism that has laid many

campaigners low after only a few years.

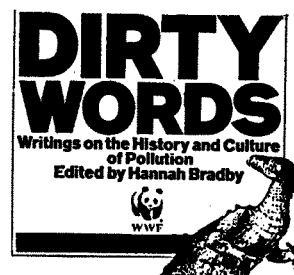
Patterson became a trouble maker by accident. Troubled by the authorities denouncing opposition to nuclear power as a result of ignorance he was spurred to find out more. Helped by his academic background as a nuclear physicist, he was disturbed by what he discovered, and the more he discovered the more disturbed he became. He became a trouble maker: someone who takes it upon them self to confront an issue when those who should be responsible are making a mess of it.

Armed with only a three piece suit – he thinks he invented its use as a subversive tool – he would pounce on unsuspecting Cabinet ministers or company directors and de-

bate the issues, which made it "much more difficult for them, if they did not realise until after you left that they had been talking to a weirdo." "Trouble making is habit forming."

The book is intended to join-the-dots of media hype on pollution and give a fuller picture. I am not exactly sure who this book is intended for but, I enjoyed it. Maybe it was meant for me?

MIKE TOWNSLEY



LETTERS

Dear SCRAM

I have subscribed to SCRAM for several years and have found the overwhelming majority of articles carefully argued and based on verifiable research. This high standard has undoubtedly protected the reputation of SCRAM against attacks from the pro-nuclear lobby.

I was therefore dismayed to read Roger Coghill's article *The Killing Fields* (SCRAM 79, Oct/Nov 1990) on the possible harmful effects of electro-magnetic radiation. The question is

one which definitely deserves serious consideration within the pages of SCRAM, but I would query if Coghill's article qualifies as such. Clearly his principle intention was to scare us into buying his book, which may explain his failure to provide references for the various studies he cites but he makes so many unsubstantiated claims that it is easy to dismiss the whole article as irresponsible scaremongering.

To take one instance: he suggests a link between AIDS and 'electropollution' and implies enigmatically

that somehow homosexuals might be more susceptible.

This completely disregards the fact that AIDS is spreading fastest in the world among heterosexuals in central Africa, where the average exposure to electro-magnetic radiation is far lower than in Europe and North America. Now that many 'first-world' homosexuals have drastically modified their sexual behaviour, their rate of infection with HIV virus is falling correspondingly, while that of heterosexuals continues to rise.

There may be much truth in

Coghill's claims, but I doubt whether his article will lead to their being taken seriously. By publishing it, I hope you have not done a disservice to your more responsible contributors or indeed yourselves.

Yours sincerely
(Dr) Ian Campbell
Cambridge

SCRAM welcomes the submission of letters for publication. Letters may have to be edited to fit available space.

RENEW

Technology for a sustainable future

After 12 years, NATTA's well received bi-monthly newsletter focussing on renewable energy developments has been relaunched, in a new format and with a new name - RENEW. Information on new environmentally sustainable technologies based on natural sources; and related developments in energy efficiency and material recycling.

Issue 70 out in March; £1.90 per copy, or subscribe – £8pa (unwaged), £10pa (waged), £25pa (institutions); from Natta, c/o Energy and Environment Research Unit, Faculty of Technology, The Open University, Walton Hall, Milton Keynes MK7 6AA.

– SCRAM wishes RENEW well –

RENEW

The new newsletter from NATTA

LITTLE BLACK RABBIT



Were Little Black Rabbit not so long in the tooth, it might have come as a shock to discover the latest attempt by Nuclear Electric (NE) to gain respectability. Perhaps as much to impress their Creator as their customers, they have hit upon the idea of sponsoring Bristol Cathedral Choir! The new cost conscious NE, with great financial prudence, are backing the choir with taxpayers money – to the tune of £250,000! LBR does not know if the terms of the sponsorship deal require the Choir to sing the praises of nuclear power, or just to plaster their logo around the cathedral.



British Nuclear Forum (BNF), the propaganda arm of the nuclear industry are, like NE, looking to improve the industry's image. The head of one advertising agency shortlisted for BNF's business justifies the work by saying "I see our role as rather similar to that of a barrister [the English equivalent of an Advocate]. We are here to put a client's case as well as we possibly can."

Of course, a good lawyer knows when to tell their clients they should admit guilt and go for a reduced sentence.



Despite the lack of funds, anti-nuclear groups do keep winning the arguments. This fact has clearly upset Energy Minister Tony Baldry. In a recent speech, he attacked "pressure groups who ... are not above giving selective or misleading information to get a point across."

Baldry complained: "The bulk of letters my Department receives about nuclear matters ... are not so much about its economics but about radioactivity, health, the environment, nuclear waste and safety." In a major contribution to overturning what he describes as "public ignorance", Baldry states "The nuclear industry is ... arguably our safest" with an "excellent safety record". His peroration says it all: "A nuclear industry accepted by one and all as safe and economic would be a tremendous benefit to the country."



Scottish Nuclear are coming to terms with the financial realities of decommissioning Hunterston A. The original plan for a 'green field site' is under review (SCRAM 79), with the quicker and cheaper 'pile of earth' 'solution' under active consideration. Thanks to news from wee brown desert rat, LBR can

exclusively reveal that a third method of decommissioning is now being looked at. Even quicker and cheaper than entombment, LBR brings you 'surgical strike' – just drop a few high explosive, laser guided bombs on it. Safety fears over this technique were rapidly dispelled by Government Minister Tom King, who assures us the method can be carried out in such a way as to "minimise the risk of contamination outside the sites or even the buildings."



From the Tony Baldry school of information comes Nigel Holloway, a senior consultant with the UK Atomic Energy Authority. Holloway clearly does not support the 'radiation is good for you' line trotted out by the nuclear industry in the past. Instead he produces a scenario where the nuclear industry is the salvation of the planet.

His case appeared in an article *Uranium: don't leave it in the ground* (ATOM, June 1990). Digging up uranium and putting it in fission reactors produces a radioactive decay process much quicker than found in nature. Thus, the nuclear industry could save the Earth and generations into the distant future from the evils of radiation. Nice one Nigel!

Three ways to promote safe energy

Three ways to help SCRAM: fill in the appropriate section(s) together with your name and address and return the form to the address below.

1 I would like to **subscribe** to the **SCRAM Safe Energy Journal**, and I enclose an annual subscription fee of:

- ☐ £13.50 (ordinary)
- ☐ £6 (concession)
- ☐ £22 (supporting)
- ☐ £100 (life)
- ☐ £33 (institutional)

Overseas:

Europe add £2.50;
Outwith Europe add £4.50.

2 I would like to make a **donation** to **SCRAM** and enclose a cheque for:

- ☐ £10
- ☐ £25
- ☐ £50
- ☐ £100
- other £ _____

3 I would like to help SCRAM with a regular monthly donation of:

- ☐ £1 ☐ £5 ☐ £10 other £ _____

To the Manager _____
(your Bank)

Address (your Bank) _____

Please pay on _____ (date) the sum of _____ (amount) from my account number _____

to the Royal Bank of Scotland,
142/144 Princes Street, Edinburgh (83-51-00) for the credit of SCRAM No.2 Account 258597 and make similar payments monthly until further notice.

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