SCRAM

The Safe Energy Journal

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Plutonium Fright Path

Turbines for Tomorrow

Nuclear Power Fiend or FoE?

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This Journal is produced for the British Anti-Nuclear and Safe Energy movements by the Scottish Campaign to Resist the Atomic Menace (SCRAM).

We welcome contributions of articles, news, graphics and photographs.

Deadline for feature articles for the next issue: **7 January.**
(Please try and keep contributions to 600 words per page)

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COMMENT

Regular readers will have already noticed that SCRAM's roving reporter, Little Black Rabbit, has voluntarily given up the back page to accommodate our financial appeal. Allow us to explain our plight.

Our financial review has forced us to conclude that to continue our work, of which publishing this Journal is only part, we need a significant cash injection. Part of our funding strategy is to appeal to you, our readers and supporters, for help. From feedback we have received, we know that you think our work is valuable. We believe you will respond to this appeal to allow this work to continue.

We need to raise at least £6,000 in the appeal to cover this year's projected deficit. One-off cash donations will obviously be welcomed, but what we are looking for is more permanent funding. We would urge you to consider taking out a bankers' standing order to SCRAM's wages account - this will give us a regular income we can rely on. If only 100 supporters were to give £10 a month, our staff costs could be more or less secured - more people giving more could herald a wage increase for our three staff, whose combined income wouldn't cover the cost of a QC for half a nano-second!

But, what have we done to deserve your support?

The past year has seen a change of style and emphasis in the Journal: we are devoting more space to the alternatives to nuclear power, and we are addressing the urgent environmental problems - acid rain and the 'greenhouse effect.' This represents the changing direction of global energy politics.

SCRAM were instrumental in drafting the Early Day Motion demanding an inquiry into this Government's abandonment of wave power R&D (page 22), and we have provided much valuable information for the alternatives' case at Hinkley.

We have provided information for the campaign against Nirex; we have advised the Nuclear Free Zones on nuclear waste, plutonium flights, Dounreay, and many other issues; we helped organise the 4th low-level radiation and health conference and produced the report.

Through these pages we have drawn attention to issues as diverse as the Magnox Dissolution Plant, dumping of 'Chernobylised' food, global warming, the fuel wood crisis, and energy efficiency.

Please help us to continue our work by filling out the form on page 27. Give SCRAM a Christmas present and help make next year a happy one.

Nuclear Power - Fiend or FoE?

Just one month after her infamous 'green' speech to the Royal Society Mrs Thatcher has declared "We need to look at having a far heavier nuclear programme. Do not forget the greenhouse effect is [caused] partly because coal has heavy sulphuric and nitric oxide in it." MIKE TOWNSLEY assesses the Prime Minister's statement.

The above quote shows the depth to which Mrs Thatcher is prepared to sink to protect the nuclear industry. It illustrates the contempt in which she holds environmentalism.

If the Prime Minister is as concerned for the environment as her speech implies, the former ICI chemist should have instructed her polemic providers to do their homework: sulphur and nitrogen are not present in coal as oxides - the oxides are a by-product of combustion - and they are the central gasses of acid rain **not** the greenhouse effect: **carbon dioxide** is fossil fuels' most significant contribution to global warming.

The Global Greenhouse Network (GGN), formed in Washington last month, involves top scientists from over 80 countries. They have formulated a 9-point action plan, emphatically rejecting the nuclear option as both too expensive and dangerous. Instead they advocate a "rapid transformation," encouraged by tax incentives, away from fossil fuels and towards renewable energies. A view echoed by both the Declaration from September's Toronto conference on the subject, and the Bruntland Report.

They also recommend the retirement of Developing World debt as an incentive to preserve the rain forests, and a carbon tax on coal, gas and petrol. Thatcher has warned that we will need to adopt afforestation on a very large scale. In her philosophy, this can only be facilitated by restoring the tax incentives removed in the budget in response to the mass outcry over conifer planting in wilderness areas.

Any bid to counter the greenhouse effect must be spearheaded by energy efficiency. GGN believe energy efficiency must be actively promoted, and point to the effect of OPEC price increases which have prompted a 30% improvement in energy efficiency in the US over the last 15 years.

The **Negawatt Resource** - energy efficiency - (SCRAM 67) can be implemented cheaply and quickly: mean UK electricity demand could be reduced by 70%, at 80% of the cost of the same nuclear-generated CO_2 reduction. This would leave considerable funds free for investing in renewable energy systems.

PARKINSON DISAGREES

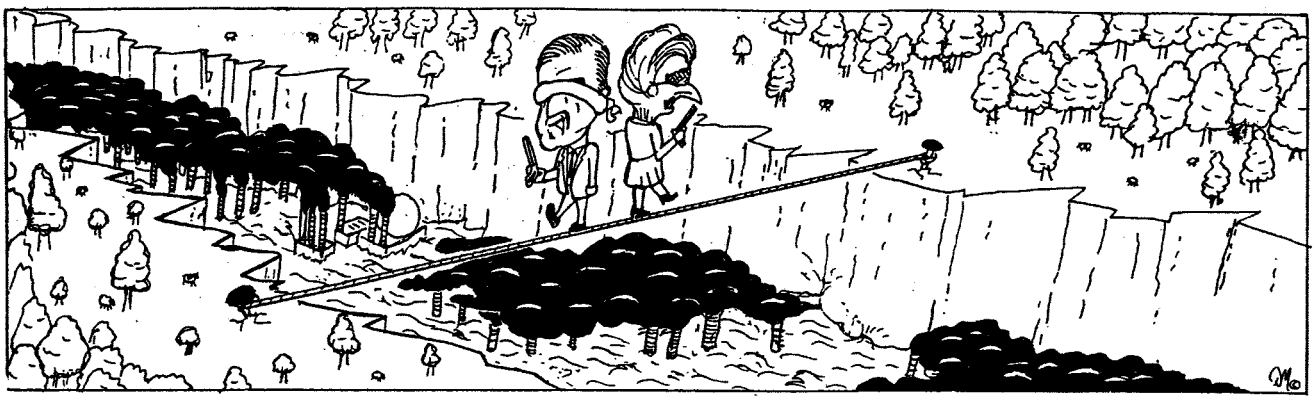
The Energy Secretary, Cecil Parkinson, does not appear to share his Prime Minister's sense of urgency over the greenhouse effect. In a recent interview with Tom Wilkie of the **Independent**, he denied that the UK would be embarking on a massive nuclear programme: "Over the next decade or so, the technology will either make its case on economic grounds or not." During parliamentary energy questions, Parkinson further emphasised his position by saying that he felt "maintaining our nuclear capacity at its present level is right."

This is little comfort for the proponents of energy efficiency. Parkinson comments "In a free society it is difficult to impose energy efficiency on an unwilling society." Yet he informed Wilkie, "A 'nuclear tax' will be levied on all users of the national grid - even if they are not buying electricity from nuclear stations - on the grounds that all will benefit from there being a diversity of sources of power, and therefore everyone ought to pay for it." Compounding his confusing conundrums, he adds, "this is not the time to abandon nuclear technology and it is worthwhile distorting the market to maintain this component and diversity of sources of supply." Apparently some things are more free than others!

So what does the Energy Secretary propose to do about the greenhouse effect? He informed parliament that it will be tackled in various ways - the use of nuclear power, controlling emissions from fossil fuel power stations, greater energy efficiency and increasing the use of lead free petrol.

Parkinson has clearly spent as little time as Mrs Thatcher has researching the greenhouse effect. Nuclear power is not the answer; and there is as yet no economically viable method for removing CO_2 from fossil fuel fired power stations. Energy efficiency is indeed the heart of the solution, but he has no intention of laying the necessary legislation to make this option viable. Increased usage of lead free petrol? SCRAM as yet can find no link between lead in petrol and the greenhouse effect.

With the advent of so-called green politics we might have hoped for some improvement in Government policy. Instead it has grown more complicated and less coherent: the nuclear spectre has not vanished, it has merely adopted a green hue.



Microbe Mayhem?

The spectre of new virulent strains of micro-organisms evolving in nuclear waste repositories was raised by Dr Don Arnott in a speech given to the Scotland Against Nuclear Dumping Conference in September.

Don is not the first scientist to consider such an awesome prospect. Sidney Harland, in his time one of our leading geneticists, considered that the outbreak of virulent influenza experienced following the Bikini bomb-tests of the '50s might have been triggered by the radioactive fallout.

It isn't wise to assume any chemical element, whether metal or non-metal, is immune from the attentions of microbes. They have a use for arsenic; have been found in jet fuel, and can even metabolise several sorts of plastic. There is almost no such thing as a bug-free environment.

Many microbes will grow at radiation levels which would inhibit or destroy all other forms of life, and their spores are even more resistant. Microbes can turn extreme circumstances to their advantage. The problem with radiation is that it is mutagenic. The rapidity with which microbes can multiply in favourable environments means that the probability of a successful mutation occurring is significant.

These facts are pertinent, not only to the Nirex waste dumping programme, but also to high-level waste, temporary waste storage facilities, radioactive waste transport and probably other nuclear activities as well.

Research by the Natural Environment Research Council (NERC) has established that no repository site actually examined (boreholes and mines) was free of micro-organisms, and that it seems certain no site will ever be. Microbes can speed up the corrosion of metal canisters, physically damage the backfill and assist the transport of radionuclides via groundwater.

What is certain is that we don't know enough about micro-organisms and nuclear waste. There is an urgent need to view things holistically in sufficient detail to discover the interrelations between geology, geochemistry and microbiology.

Don's paper **Micro-organisms and Nuclear Waste: a neglected problem** is available from SCRAM for £1 (incl p&p).

Lords Waste Report

The Lords European Communities Committee have rejected the view that nuclear waste should be stored indefinitely above ground at the site of production.

They conclude that low-level and short-lived waste can be satisfactorily disposed of in shallow repositories, and that "deep geological disposal for HLW and long-lived wastes should be pursued with determination."

However, they recommend full investigation of direct disposal of spent fuel, in terms of both the economic and environmental implications. They reject long-term dry storage and direct disposal for spent magnox fuel because there are still uncertainties about the chemically reactive fuel, there would be no significant reduction in radiation exposure, and the magnox stations are coming to the end of their lives.

They believe BNFL should discharge their obligations to their foreign customers and complete THORP, but concede the value of reprocessing may be very different when contracts have been completed, and will depend on factors including costs compared with new uranium supplies.

With the prospects for the fast breeder not looking good, a more immediate option for recycling recovered uranium and plutonium would be to use Mixed Oxide Fuel (MOX) in PWRs. BNFL are planning to enter this market in the next five to ten years.

Swedish Waste Programme

A Swedish group, The People's Movement Against Nuclear Power and Weapons (FMKK), in a new report, claim the Swedish nuclear industry's international reputation for having 'solved' the nuclear waste problem is nothing more than a public relations ploy.

Serious consideration of the problem began with the publication of the final report of the Commission on Radioactive Waste (AKA) in 1976. They proposed storage underground for all types of waste. They maintained there would be no seepage of radionuclides because of the absence of fractures in the rock.

In 1977, a high-level waste storage design proposal, KBS-1, was submitted to the government for approval - KBS-2 and KBS-3 followed in 1978 and 1983 respectively. The history of the KBS affair - a scandal which brought down a government and caused public mistrust of the regulatory agency - is detailed in the report. Yet these theoretical designs fulfilled their task for the nuclear power companies, gaining permission to fuel and operate the six new nuclear reactors, which the 1979 referendum had failed to shut down.

In 1980 the Government decided to build The Central Storage Facility for Spent Nuclear Fuel (CLAB), a large cavern 30 metres underground with an initial storage capacity of 3,000 tonnes in four ponds. It is located at the Oskarshamn nuclear site, and began operating in 1985. All Swedish spent fuel will go to CLAB after 6-12 months storage at reactor sites. It has an expected life of 40 years; 'final disposal' at a site yet to be determined will follow.

"There is no doubt" say FMKK, "that CLAB was approved to reduce the pressure to find a 'permanent' storage method."

Geological investigations to find a suitable site for a high-level waste storage facility, have taken place at a number of locations., in the face of increasing public protest.

Sweden also has a 'Final Storage for Reactor Waste' facility, SFR-1, under the seabed off the Forsmark reactor site. It takes low and medium-level nuclear waste. Construction began in 1983, and the first containers were placed there in 1988.

SFR-1 was granted permission based on assumptions about dilution in the Baltic Sea. Radionuclides are expected to flow into the Baltic two to ten years after the storage area has been sealed. As the rock does not constitute a barrier - it is riddled with fractures and faults - SFR-1 is nothing more than delayed sea dumping.

In 1979 the Swedish Government was the first to claim the nuclear waste problem had been solved. Unfortunately for them, it didn't stop the protests.

Nuclear Waste in Sweden: the problem is not solved is available from Bjorn Helander, Stobegatan 6C, S-41653, Goteborg, Sweden. 35 Crowns (US$6) inc p&p.

"Radiological Accident in Goiania"

In 1987 Brazil suffered a tragic accident in Goiania resulting from the misuse of a strongly radioactive medical source. This serious radiological accident came after a series of similar accidents in Mexico City (1962), Algeria (1978), Morocco (1983) and Ciudad Juarez in Mexico (1983). The extent to which these accidents were reported has varied considerably with a consequent loss of information. With this in mind the IAEA has collaborated with the Brazilian authorities to record the events, and has now published its review "The Radiological Accident in Goiania."

In 1985 a private radiotherapy institute in Goiania moved to new premises and left behind a caesium-137 teletherapy unit without informing the licensing authority as they should have done. In September 1987 two people looking for scrap, removed the source, and took it home to dismantle it. They sold the remnants to a junkyard owner, who noticed that the source material glowed blue in the dark. Over the next few days friends and relatives came to look at this phenomenon and took away fragments. A number of people then began to show gastrointestinal symptoms arising from their exposure to radiation.

When the illness was finally connected to the source material, the speed and scale of the authorities response were impressive. 20 people were hospitalised, but four of them eventually died. Prussian Blue was used to promote the decorporation of caesium. Decontamination of the patients' skin and various radiation injuries posed a problem, as did disposal of the contaminated excreta.

Seven houses had to be demolished and the surrounding soil removed. 42 houses required decontamination by vacuum cleaning inside and by washing with high pressure water jets outside.

The packaging of the waste required 3800 metal drums, 1400 metal boxes, 10 shipping containers and 6 sets of concrete packing - equivalent to 275 lorry loads. No decision has yet been taken on the final disposal site.

The main lesson learnt is that the security of radioactive sources is of paramount importance. Although the licensee should be ultimately responsible, there should also be an appropriate regulatory authority. The IAEA suggest that the licensee be required to inform the regulatory authority each time the integrity of the source is checked. In the event of an accident there should be a well understood chain of information and command, and the emergency team should include administrative and public information staff.

The fact that, almost overnight, a small medical radiation source can cause a disaster, probably second only to Chernobyl in its severity, shows that radiological protection outside the nuclear sector deserves far more attention than it currently receives.

US Safety Concern

Operator error was involved in 2197 of the 2940 mishaps at US nuclear reactors in 1987, according to Public Citizen's new report **Who's at the Controls?** Yet the Nuclear Regulatory Commission (NRC) has passed responsibility for training to an industry trade group.

Public Citizen accuse the NRC of allowing the industry to use poorly trained workers, and reveal dozens of instances of workers sleeping on the job, arson, vandalism, use of firearms and drug and alcohol abuse.

They demand that the NRC issue binding regulations on training, and those plants with the worst training programmes should be closed until adequately trained staff are in place.

Sizewell Inquiry

Timothy O'Riordan and Ray Kemp, who are evaluating the Nirex consultation, are authors of the 474 page book **Sizewell B: An Anatomy of the Inquiry** (Macmillan, £45). Resulting from a £46,000 research effort, it will be immensely useful for Hinkley objectors. It includes an index to the Inquiry, and comprehensively sets the scene for Hinkley.

Correction

We have been asked to point out that potassium iodate or iodide, not **iodine**, tablets should be issued in the event of a nuclear accident (SCRAM 66, page 5).

There were several cases of iodine poisoning reported in the Soviet Union after Chernobyl.

NFZ AGM

The Nuclear Free Zone movement has come a long way since November 1980, when Manchester City Council passed a resolution calling on the government to "refrain from the manufacture or positioning of any nuclear weapons of any kind within the boundaries of our city," and appealed to "all local authorities throughout Great Britain to make similar statements on behalf of the citizens they represent."

There are now about 180 local authorities who have declared themselves Nuclear Free, and about 200 delegates from over 100 of them met in Glasgow on 19/21 September for the national AGM and Conference.

To illustrate how much the movement has evolved, from one primarily opposed to nuclear weapons and civil defence, the following topics have featured prominently in the work programme of the National Steering Committee over the last year: civil defence; local authority radiation monitoring; nuclear site emergency planning; air transport of radioactive materials; radioactive waste disposal; alternatives to nuclear power; Hinkley Point C; defence and economic conversion; nuclear warhead convoys.

After the formal business of the AGM, at which Cllr Ian Leitch of Dumbarton was elected chair and Cllrs Mary Cane of Camden and Eric Swain of Derbyshire were elected vice-chairs, a series of workshops were held. Most of the above issues were discussed in detail, from which the direction of the next year's work programme would develop.

With the inclusion of energy conservation and alternatives to nuclear power in their remit, the NFZs will hopefully be as successful in bringing these issues to the public's attention as they have been with civil defence and nuclear power. The environmental issues of acid rain and the greenhouse effect must be next to be added to the agenda.

Nirex News

Caithness District Council have retracted their invitation to Nirex to carry out test drilling in the County, after accusing them of misrepresenting the council's position as one of open-armed welcome for nuclear dumping.

The results of the £5 million per year research programme into the safety of the deep disposal of low and intermediate level nuclear waste, was presented by Nirex at a seminar in November, to scientists and environmentalists. But a great deal of research still remains to be done.

After the meeting Professor John Knill, Chair of the Radioactive Waste Management Advisory Committee, warned that research had not yet gone far enough, nor had it taken full account of the disturbance to surrounding rock caused by repository excavation.

The safety assessment has to quantify and model the pathways by which radioactivity can return to the environment, and show that the increased risk of fatal cancer to any one member of the public is likely to be less than one in a million in any one year.

Nirex admit that groundwater will eventually saturate the repository, and that radionuclides will migrate to the surface. "It **may** take hundreds of thousands of years for water to travel from depth up to the surface." (emphasis added). They make no comments on their worst case scenarios, only saying "it is **likely** to be at immensely long times into the future."

As it is clear that the waste cannot be contained forever, research has to discover how the steel drums will corrode; how durable the concrete backfill will be; and the rate at which each separate radionuclide moves through the porous cement.

Micro organisms will be present in the repository, but they only have "preliminary evidence" on how they can enhance the solubility and transport of radionuclides.

Appreciable volumes of gas result from corrosion of metal, decomposition of cellulose and the activity of microbes. Models have to estimate the rate of production and speed of migration from the repository. Gas could be a hazard, by contaminating the surface and by exploding.

The processes which affect radionuclide transport are numerous and Nirex have so far been unable to develop a model which can explain the results of experiments that have been done on fractured rock. Nor are current models very useful when seawater gets into the repository.

Nirex evaluate the chance of human interference with the repository, by estimating future drilling operations.

Perhaps most difficult of all, they have to predict future changes to the earth's surface, as well as future climatic changes.

Nirex's job is very similar to weather forecasting, and we all know how accurate that is. The difference is that weather forecasts are most commonly done for the following day - Nirex have to make predictions for the next hundred or so centuries.

Nirex announced in December 1987 that they would be producing a report on the transport and packaging of low and intermediate radioactive waste. People should not feel inhibited from making commenting, they said, even though it was not part of the consultation exercise.

The document was quietly released in October 1988, and Nirex do not now propose to ask for formal responses from local authorities, despite the fact that 10 trains and 100 lorries per week will have an impact on a far greater number of authorities than the repository itself.

There is not much that is new in the document. Research on intermediate-level waste packages is only 'well advanced' and not complete; computer techniques as well as a programme of impact fire testing is being undertaken. The photograph showing the impact test in progress has the waste container drawn on.

The document is of a very preliminary nature. Nirex still have to address route selection, economics, logistics and environmental impact amongst other things. However, everyone who commented on **The Way Forward** should make their views on transport known, and not allow Nirex's low profile approach to succeed.

Presentation of the Nirex Disposal Safety Research Programme (Nov 88) and **The Packaging and Transport of Radioactive Wastes** are both available from Nirex, Curie Avenue, Harwell, Didcot, Oxfordshire, OX11 0RH.

Defence Dump

The Ministry of Defence (MoD) have applied for permission to build Intermediate-level radioactive waste stores at their naval bases at Rosyth in Fife and Plymouth in Devon. The stores are planned as an interim measure to hold waste generated by refitting the Navy's nuclear powered submarines until Nirex are able to accept it at their proposed deep repository.

Despite being above ground dry stores, environmentalists oppose them because they are both in urban areas. Kevin Owen of the Plymouth Dump Information Group says "We believe it is unacceptable to store nuclear waste in the centre of a city of over a quarter of a million people next to schools and public housing."

Plymouth City Council, Devon County Council and Caradon District Council as well as many of the local MPs are all calling for a public inquiry.

Rosyth has a population of 11,500 and is situated in Dunfermline District. The Council have yet to decide whether to object. They are, however, seeking a legal definition of storage and disposal. The waste could be on site for over 20 years before Nirex accept it, and the laws governing disposal are stricter than those on storage.

Import Ban

Lowestoft has now joined four other ports in east England - Goole, Immingham, Grimsby and Hull - where the importation of nuclear waste has been banned, after fierce local protests.

Residents at other east coast ports have been warned to watch out for further attempts by BNF to import waste from Europe. Meanwhile ALARM have asked people to inform them if they see a spent fuel flask. Copies of their leaflet with photographs can be obtained from 47, Roderick Road, London, NW3 2NP.

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THANK YOU!

Most commentators agree that the key to the success of a privatised electricity industry will be regulation. The White Papers gave few clues to the Government's intentions.

More recently the Department of Energy have stressed that they intend to give the regulator "plenty of teeth," and Ministers are determined to avoid the same criticisms which British Gas have received. The Area Boards are already said to be worried that they will be so tightly regulated that they will have difficulty operating.

However, although the Privatisation Bill is expected to reach the Commons in early December, the controversy is unlikely to end until it has passed through Parliament. The Electricity Consumers' Council, the Institute for Fiscal Studies and the Select Committee on Energy all agree that strong regulation is essential.

Despite the fact that changes are being considered throughout the European electricity industry, nowhere is competition proposed as the main principle. The main pressure for reform is for measures to guarantee new entrants access to the grid; in the US energy efficiency is encouraged.

NUKE COSTS CONTROVERSY

It is unclear how the Government will force the industry to build more nuclear power stations, now that it is almost universally agreed that they are unattractive to private investors. The Consumers' Council want nuclear power to be accounted for separately, so that the premium attached to the Government's diversity policy is clearly visible.

Dr Dieter Helm of the Institute for Fiscal Studies believes the extra costs of nuclear power will be loaded onto the domestic consumers, unless the Government take steps to prevent it. This has been confirmed by the leak of a confidential memorandum sent by the CEGB to the Government.

John Baker, chief executive-designate of National Power (the name chosen for Big G) points out that no new nuclear capacity will be built unless the full cost can be passed onto the consumer. He says that National power will have a different view of the nuclear option to that of the CEGB. They will have to protect their shareholders' interests, and "can no longer make the national case for pressurised water reactors."

Both Helm and the Consumers' Council warn that the distribution companies may be forced to lower their prices to industrial consumers in order to protect their market, and increase prices to the captive domestic market.

British Telecom are allowed to allocate prices as they see fit, as long as they remain within the overall price regulations. With the advent of Mercury, business customers have benefitted from lower prices, but domestic consumers' costs have increased faster than inflation.

Following privatisation, large consumers of electricity will be able to enter direct contracts with generating companies. In fact a consortium of companies, including British Steel, have already started negotiations with the French electricity board.

The Consumers' Council find it difficult to reconcile the Government's commitment to the merit order with the idea of direct contracts between generators and distributors. They see little incentive for competition between PowerGen (Little G) and National Power when co-operation could neuter any new competitors. Already the CEGB's ambitious ordering programme provides a disincentive to new entrants.

BALANCE IS ESSENTIAL

A strong regulator could monitor costs and contracts between the different players, protect the interests of the domestic consumer and stop anti-competitive practices. The regulator could also encourage the distribution companies to look favourably at demand management, and to diversify into energy service corporations. Experience gained from privatisation so far, suggests that to achieve the correct balance between competition and the Government's other policy goals, a strong regulator is essential.

It remains to be seen how the Government will decide to regulate the industry and how they will force National Power to build nuclear power stations, and protect the interests of the consumer at the same time.

Fright Path

As predicted in SCRAM 66, the US/Japan Agreement has been amended to allow plutonium to be returned by sea. However, the threatened closure of Carlisle airport could mean European nuclear flights being diverted from there to Prestwick airport. STEVE MARTIN reports.

John Fliger, Bulletin of the Atomic Scientists

The threatened closure of Carlisle airport could mean the transfer of nuclear shipment business to other air or sea ports by early next year. A major component of this business could include shipments of plutonium to Europe and Japan in the mid-1990s.

British Nuclear Fuels (BNFL) currently fly plutonium from Sellafield to Dounreay via Carlisle airport. About 0.3 tonne of mixed plutonium/uranium oxide fuel pellets have been flown each year for the past eight years, and about three flights per year of "fuel production line residues" are envisaged in the next five years. Formally these flights took place from Speke airport, but were shifted to Carlisle in 1986 after Liverpool City Council banned them.

BNFL have admitted they will have to look at other airports for these shipments, but they are unwilling to speculate until negotiations over alternative funding of Carlisle have been completed. A spokesperson conceded that "Prestwick would certainly be one of the airports to be considered, but it would be one of several." Prestwick has already been suggested by BNFL as the "currently preferred airport" for returning plutonium recovered from reprocessing Japanese spent fuel.

PLUTONIUM FLIGHTS TO EUROPE

But Dounreay is not the only destination for plutonium shipments from Carlisle: flights of plutonium recovered from Italian spent magnox fuel also go from Carlisle. The Advisory Committee on the Safe Transport of Radioactive Materials have calculated that "there have been, on average, four flights per year overseas ... BNFL exports in 1986/87 were less than 0.1 tonnes as were those of the UKAEA."

More frequent flights to Europe are planned from the mid-1990s after BNFL's Thermal Oxide Reprocessing Plant (THORP) starts operating. Six European countries (Italy, the Netherlands, Spain, Sweden, Switzerland, and West Germany) account for about one third of THORP's business. In total, 15 flights a year have been suggested from the UK to Europe, about 100kg in each load.

A similar number of shipments from the UK to Japan will be required to return plutonium from Japan's contract with THORP (a further third). UK domestic Boards are contracted for the other third of THORP. France will also return plutonium to Japan, as part of their contract.

SEA SHIPMENT INCLUDED AS AN OPTION

However, because of doubts that a plutonium air shipment flask can satisfy the exacting US safety standards, the Japanese authorities have pressed the US to modify the US/Japan Agreement to include sea shipment. The likely UK port would be BNFL's dedicated nuclear transport dock at Barrow.

The sea shipment option makes it unlikely that Prestwick will now be chosen for plutonium flights to Japan. However, Carlisle's closure could mean European plutonium flights from Prestwick, which are not covered by the amendment, but are instead covered by the less strict International Atomic Energy Agency (IAEA) transport regulations.

Carlisle City Council have until the end of 1988 to come up with a rescue plan to keep the airport open. This has come about because Ogden Allied, an American aviation company, pulled out of a deal to save the airport towards the end of October. It now seems increasingly unlikely that the airport will be saved.

BNFL have offered £250,000 to secure the airport open for a further five years but, since the Energy Secretary announced the run-down of the fast reactor by 1993/94, plutonium shipments to Dounreay are unlikely to continue beyond the five years. However, the overseas contracts with THORP mean that plutonium shipments to Europe and Japan will begin at about that time. Carlisle's replacement will presumably receive some of that business.

During negotiations of the modifications to the US/Japan Agreement, an additional consideration arose - some plutonium may be shipped in the form of fabricated mixed oxide (MOX) fuel rods. This issue was addressed by the 1976 Royal Commission on Environmental Pollution. They noted that shipping plutonium as a pure compound could attract terrorists. Because of this risk they considered that "such plutonium should be returned only in the form of mixed oxide fuel elements designed to suit an existing power reactor."(para 319)

The conversion of plutonium to MOX fuel rods could be controversial. They will be shipped to Japan by sea. However, BNFL do not as yet have a commercial MOX fuel fabrication plant - Dr Wilkinson, Director of Spent Fuel Management Services, told the Lords European Communities Committee in February 1988 that they don't "plan to enter into that market, producing mixed oxide fuel for thermal reactors ... (for) about five or ten years." Until then, only the French and Germans have a MOX fuel fabrication line.

In conclusion, the near impossibility of meeting the US air transport standards has forced the inclusion of a fall-back sea transport option for Japanese plutonium shipments; the threatened closure of Carlisle airport, and the lack of a commercial MOX fuel plant in the UK, could mean plutonium transports from other sea and air ports. But, there again, it all depends on THORP working properly.

Nuclear Store for Heysham

The CEGB's Heysham nuclear site has been chosen as the location for a facility for storage of spent nuclear fuel from all UK AGR stations before reprocessing. Although this seems to fit in with the policy advocated by anti-nuclear campaigners, PETE ROCHE believes it is the wrong decision taken for the wrong reasons.

If site studies prove satisfactory, a planning application to construct a "buffer" store for spent fuel from the UK's Advanced Gas-cooled Reactors (AGRs) at Heysham in Lancashire is expected in 1989. The £220m store will be a project funded jointly by the Central Electricity Generating Board (CEGB) and the South of Scotland Electricity Board (SSEB).

The announcement follows unsuccessful negotiations with British Nuclear Fuels (BNF) to site the store at Chapelcross (SCRAM 62). The final decision on construction will be left up to the newly privatised electricity companies.

Anti-nuclear campaigners advocate long-term storage of spent fuel as an alternative to reprocessing and waste dumping. However, their policy requires that a store should be built at each reactor site. Moreover, the spent fuel should be stored in a dry condition to inhibit corrosion. This policy would not only result in a significant reduction in the volume of low and intermediate-level nuclear waste produced, but would also eliminate the need for transporting spent fuel around the country.

There are also likely to be considerable cost savings. John Large, an independent consulting engineer, estimated in 1985 that dry storing magnox spent fuel would cost £47/kg of uranium compared with a cost of £88.25 for reprocessing.

ON-SITE DRY STORE DESIGNS EXIST

The National Nuclear Corporation (NNC) and GEC Energy Systems both have designs for dry stores suitable for individual station siting. Both designs allow the spent fuel to be monitored and retrieved if necessary. Once the fuel stops generating heat, the store could be permanently sealed. A GEC designed interim dry store has operated since 1971 at the CEGB's Wylfa magnox station on Anglesey.

GEC say that "irradiated fuel from the complete lifetime of the station can be stored at the site safely, compactly and economically, without release of fission products to the environment. The store can be designed such that up to 100 years lifetime should be attainable," and NNC conclude that "siting an independent dry store at an existing power station presents no problem, assuming the space is available."

Unfortunately, the Heysham proposals are not part of a strategy of long-term dry storage at each power station site. As Jane Hunt of the newly formed Lancaster Against Nuclear Dumping (LAND) says "the only thing they've got right is that it's not wet."

The CEGB say that, although the store could hold fuel for up to 100 years, their "current intent is for the store to be used as a buffer before the fuel is sent for reprocessing under the contract at THORP. It isn't the intention to store it for 100 years." The proposed store will have a capacity of 840 tonnes of spent fuel - "enough for all the spent fuel from the Boards' AGRs for up to four years." There would also be an option to increase the storage capacity by building additional vaults. So it could be assumed that the current intention is to store the fuel for something like 4 years.

HEYSHAM GIVES "INCREASED FLEXIBILITY"

This is by no means a decision to abandon reprocessing. It is simply a device to give the Boards "increased flexibility in spent fuel management," by which they mean, once privatised, they will have the option of rejecting British Nuclear Fuel's (BNF) terms for reprocessing.

The Boards have been arguing for years with BNF about the high cost of reprocessing and the charges for decommissioning the reprocessing plant have been creeping upwards. The prices of fresh uranium and enrichment are now so low that uranium recovered by reprocessing cannot possibly compete, and the CEGB have already made clear their lack of interest in the plutonium-fuelled fast reactor. The Boards will now have a trump card up their sleeve to argue for reduced reprocessing charges.

"SHIFTING THE CENTRE OF THE SPIDER'S WEB"

The Heysham store will not eliminate the transportation of spent fuel either. A centralised store means that spent fuel from all of the UK's AGRs will be travelling to Heysham, "like shifting the centre of spider's web from Sellafield to Heysham," according to John Large. There is a radiation dose to the public from spent fuel transport, and the dose to people living around Heysham is going to increase as a result.

A packed meeting in Lancaster in October, organised by LAND, heard Dr Brian Wynne suggest that if reprocessing is abandoned, "there (is) every chance that (Heysham) would become a permanent home for the unwanted products of nuclear power." There is no technical reason why the store couldn't be used for PWR spent fuel, vitrified waste and intermediate-level waste.

LAND do not oppose a store to take Heysham's own spent fuel, but as Jean Emery of Cumbrians Opposed to a Radioactive Environment told the meeting, "it is morally bankrupt that some areas of the country are prepared to have the benefits of nuclear power, but none of the risks . . . each reactor should take the fuel it creates in dry storage."

There is a every chance that the privatised electricity industry will abandon reprocessing. They may even be persuaded to build dry stores at each power station site after a few years' operating experience at Heysham. But in the meantime they should be told that they cannot use the people of Lancaster as pawns in their bid to gain the upper hand with BNF, and if they want to gain experience with AGR dry storage, they should experiment **only** with on-site dry storage.

Reactors at Sea

Five nuclear submarines and over 20 nuclear missiles have been lost at sea; two nuclear weapons accidents and a number of near misses have occurred; the Royal Navy appear to have no idea what will be done with decommissioned submarines. COLIN HINES outlines the Greenpeace Nuclear Free Seas Campaign which aims to bring these environmental hazards to the public's attention.

Imagine the response of a community being asked to allow the regular movement of operating nuclear power stations in and out of their area. If it was added that nuclear weapons would also be involved, sometimes travelling in the same container as the nuclear power station, the result could make the mid 1980s opposition to nuclear waste dumps pale into insignificance.

Yet this is exactly what Rosyth, Faslane, Holy Loch, Plymouth and Portsmouth already have to endure. They are all naval bases or dockyards for nuclear powered and sometimes nuclear armed submarines. Plymouth, Portsmouth and Rosyth are also host to British aircraft carriers, destroyers and frigates armed with nuclear depth bombs and nuclear free fall bombs.

To highlight the environmental hazards of living so close to these naval nuclear facilities, Greenpeace this summer toured these bases as part of their Nuclear Free Seas Campaign, and published reports for each site (see SCRAM 67, reviews). We catalogued the potential for a power reactor or nuclear weapons accident, the likely effects on the surrounding population, the inadequate monitoring of routine radioactive discharges, and the above average leukaemia incidence in these areas. The hopelessly unsatisfactory 'Dad's Army' accident emergency plans drawn up by the Royal Navy were also exposed.

ACCIDENTS HAVE HAPPENED

Luckily, no serious accident has so far occurred at a naval nuclear base. But on 26 January this year, the nuclear powered Polaris missile submarine Resolution experienced a power cut at Faslane. The reactor coolant water pumps were lost; two back up pumps failed; a further motor didn't respond: alarms at the base went off and heat built up in the reactor core.

Local MP John McFall accused the Royal Navy of denying the accident until reports appeared in the national press. The Ministry of Defence then described the incident as a "minor electrical malfunction." Yet, according to Dr Richard Webb, a former US Navy nuclear engineer, the reactor could have been only minutes away from overheating leading to an unstoppable meltdown.

There are at present 544 floating nuclear reactors. There has already been one reactor meltdown at sea; five nuclear reactors have been abandoned on the ocean floor; and over 20 nuclear missiles have been lost. In October 1986 a Soviet submarine sank following an explosion on board: at least 15 nuclear weapons and two reactors went down with it. These had a radioactive inventory twenty times that released from Chernobyl.

Submarine reactors are small compared with commercial power reactors, but they regularly glide into the heart of communities of hundreds of thousands. However this is not the only threat posed by the naval nuclear bases.

An accident could occur involving a nuclear weapon on board a nuclear armed submarine or one of the aircraft carriers, destroyers of frigates which carry some of the 190 nuclear depth bombs and free fall bombs assigned for naval use. It is most likely to be caused by an electrical or fuel fire resulting in the ignition of the warhead's conventional explosive. This could lead to the widespread distribution of a radioactive cloud.

Such accidents have already occurred. Crashes involving nuclear armed US aircraft - at Thule, Greenland in 1966 and Palomares, Spain in 1968 - led to extensive radioactive contamination in both areas. The US Department of Defense have calculated that a 2.5 mile wide radioactive cloud could spread for 28 miles downwind of a nuclear warhead accident.

Western Scotland had a narrow escape in November 1981 when a Poseidon missile being unloaded by crane from a submarine fell over 5 metres and slammed into the side of the submarine tender before being stopped by a safety device. The missile reportedly contained the unstable conventional explosive LX09 which four years earlier had exploded at a nuclear weapons plant at Amarillo in Texas when being tapped into place with a rubber mallet. The resulting explosion killed three people and hurled debris more than 100 metres.

INADEQUATE EMERGENCY PLANS

The Royal Navy's accident emergency plans for the naval nuclear bases are a complete fantasy. No mention whatsoever is made of the possibility of a nuclear weapon accident; the radioactivity predicted to be released from a reactor accident is miraculously expected not to cause significant problems, nor require evacuation, beyond a distance of 550 metres. This conveniently coincides with the bases' perimeter fences.

Furthermore it is the Royal Navy which monitor the discharges and make the decisions concerning evacuation. They decide when to inform the local authority and emergency services and when to issue press releases. Their complacency concerning the seriousness of the consequences of any accident is typified by a pre-written press statement: "an accident has occurred ... which has resulted in the release of a small quantity of radioactive fission products."

The greatest absurdity is that the existence of these safety schemes is not widely known, and it is virtually impossible to obtain a copy. In Portsmouth the local South Coast Against Nuclear Navies group had to go through Kafkaesque hoops to find a copy of their local emergency document. Various local authority departments had never heard of it, and when it was eventually tracked down to a filing cabinet in the history section of the local library the group were told that it could not be photocopied because of copyright laws! This for a port where, over the past 4 years, there have been up to 200 US nuclear weapons brought in by US submarines and surface ships each year, as well as being host to UK nuclear depth and free fall bombs on the aircraft carriers based there.

NO DECOMMISSIONING STRATEGY ADMITTED

Another environmental threat highlighted by the Greenpeace tour was that, like their civil counterparts, the Ministry of Defence have no detailed ideas of how to deal with nuclear reactors once they have been decommissioned. This was typified by a dismissively jaunty remark made earlier this year to the Defence Select Committee by Mr J Peters, Assistant Under Secretary of State for the Navy. When asked about decommissioning of the first naval reactor be asserted: "there were quite enough problems to contemplate at the time without thinking too much about what on earth we should do with it when we were finished with it."

The highly radioactive fuel rods from the first UK submarine, Dreadnought, have already been removed but the reactor core and piping remains radioactive. The sealed hull presently languishes in the corner of Rosyth Dockyard. By the turn of the century nine more nuclear submarines will have been decommissioned. It appears from press reports that the Government's preferred option is to dump these submarines at sea. Even with the fuel removed, these submarines, if dumped shortly after decommissioning, would still contain about half the total radioactivity of all nuclear waste disposed of at sea by the British between 1949 and 1982.

The only way for populations living around the world's naval nuclear bases to be rid of these environmental threats is for the disarmament process, begun with the INF Treaty, to spread to naval nuclear weapons, and for nuclear powered vessels to be phased out as rapidly as possible.

In the interim, it is vital that those living near the bases are aware of the dangers of living cheek by jowel with floating nuclear power stations and nuclear weapons. The local authorities must play a more active part in monitoring the routine radioactive discharges from these bases, as well as the local cancer statistics. They must demand an active role in more realistic, and tested, evacuation plans.

COLIN HINES is the Greenpeace Nuclear Free Seas Campaigner.

Moby Dick visit to Rosyth to confront the Royal on its nuclear ship policy (12.7.88)

Radiation & the Environment

Two reports published in recent months address topics covered in earlier issues of the SCRAM Journal: environmental radioactivity monitoring around nuclear installations, and radon gas in houses. PATRICK GREEN reviews their findings and conclusions.

Soon after the Chernobyl nuclear accident the Central Electricity Generating Board (CEGB) asked the Watt Committee on Energy - an independent voluntary body promoting research and development, disseminating knowledge and encouraging constructive analysis in the energy field - to undertake an independent assessment of their radiation monitoring systems around their nuclear power stations. In May 1987 the Committee set up a working group, under the chair of Professor Keith Boddy from the Regional Medical Physics Department of Newcastle upon Tyne General Hospital. Their report - **Radiation Monitoring around CEGB Nuclear Power Stations** - was published in mid October.

Following a detailed investigation, the working group announced they were "impressed by the scope of the Board's monitoring programme." However, they stated that the communication of the monitoring results to the public was inadequate. In particular, the working group observed that the CEGB undertake far more monitoring than is published in their annual reports. At the report's launch a CEGB spokesperson admitted that they will have to try harder! What this spokesperson did not say was why the CEGB had not publisbed this information up to now.

WHOLE BODY MONITORING ADVOCATED

Other recommendations of the working group included the suggestion that whole body monitoring of people around CEGB sites should be conducted on a routine basis. The report states that such a system would be "potentially useful in providing more positive reassurance (or otherwise) to the general public." This is true but it must also be borne in mind that whole body monitoring only detects gamma emitters, it does not measure alpha or beta particles. It is the effect of alpha particles, like plutonium, on the foetus which provides the biggest concern in the leukaemia clusters debate.

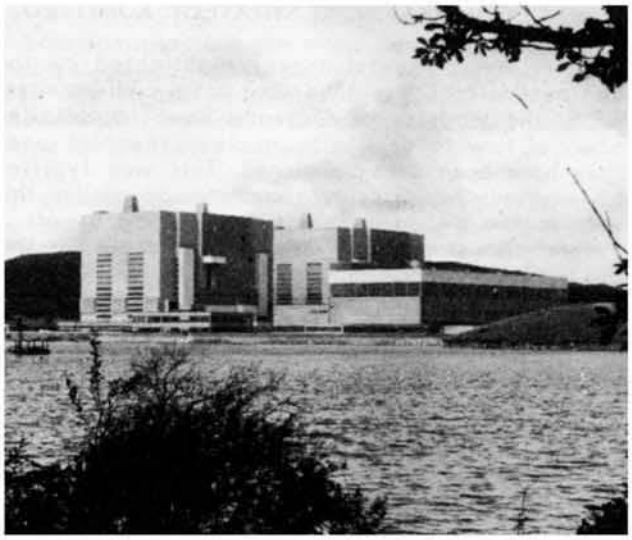
However, despite these limitations whole body monitoring, conducted by the area health authority, is to be recommended. When whole body monitoring, commissioned by a TV station, was conducted in the Trawsfynydd area after Chernobyl, the conclusion was reached that the caesium in people's bodies was not all due to the accident.

MONITORING RESULTS DISCREPANCIES

The working group did not set out to assess the effectiveness of the monitoring carried out by the Ministry of Agriculture, Fisheries and Food (MAFF). However, they did compare some of the CEGB's results with those of MAFF. While there was general agreement, they did find a surprising number of discrepancies, particularly at Trawsfynydd. It was their treatment of these inconsistencies which was the most disappointing aspect of the report.

The report observes that a large variation in contamination levels is to be expected in biological samples. This variation, coupled with statistical uncertainties in the analytical procedures, would account for the discrepancies. This is true, but only in part. The purpose of any monitoring programme should be to ensure that the sampling procedure produces a representative sample to account for this variation. If the procedures of both MAFF and the CEGB produced a representative sample, it would seem reasonable to argue that they should have obtained results that were in closer agreement.

The report also observes that different sources of supply for fish were used, leading to the differences in results. They suggest that the CEGB and MAFF should coordinate their monitoring on a closer basis. The purpose of monitoring is to estimate public exposure. Therefore, monitoring systems should take account of **all** sources of supply, otherwise an accurate assessment of public exposure cannot be made.



Trawsfynydd nuclear power station

At Trawsfynydd the discrepancies were particularly wide. For instance, in 1985 there was good agreement between MAFF and tbe CEGB for radiocaesium in brown trout. For rainbow trout the CEGB's results were three times higher than MAFF's. In 1986, the CEGB's results for brown trout were two times higher than MAFF's, with an even greater discrepancy for rainbow trout.

MAFF PROCEDURES SHOULD BE EXAMINED

The acid test for the effectiveness of any monitoring programme is the reproducability of its results. Having noted the discrepancies between some of the CEGB and MAFF data, it would have been useful if the Watt Committee had undertaken their own independent monitoring programme. They did not, and the question as to whether the CEGB's monitoring procedures, or more importantly MAFF's, are sufficient to assess public exposure remains unanswered.

Friends of the Earth have conducted monitoring around Trawsfynydd (**SCRAM 59**) and found large discrepancies between our results and MAFF's, particularly for cobalt-60. Perhaps the time has come

for someone to undertake a review of the effectiveness of MAFF's monitoring procedures.

Establishing the cause of such discrepancies is essential if public exposure is to be accurately assessed. The report states that they were satisfied that most people who live close to nuclear sites would not receive a radiation dose in excess of 10 micro-sieverts per year, although a "few" people comprising the critical group might receive doses up to 1 milli-sievert. The report does not say exactly how many people receive the higher doses. The exposure was justified by comparison with natural background radiation. This misses the point.

ACCEPTABLE OR UNACCEPTABLE?

Last November the National Radiological Protection Board (NRPB) recommended, because of their revision in risk estimates, that members of the public should receive no more than 500 micro-sieverts per year from a single nuclear site. They stated that exposure at their recommended dose limit, 1 millisievert, was equivalent to a fatal cancer risk of 1 in 33,000, which according to the Royal Society would probably be unacceptable.

The Royal Society estimate that a risk of 1 in 100,000 marks the boundary of unacceptability for members of the public. Risks smaller than this would probably be acceptable to most people, while larger risks would probably be unacceptable. On this basis members of the public around CEGB nuclear sites who are exposed to around 1 mSv per year face an unacceptable risk. The fact that others may face a higher risk, from radon for example, is no justification for this risk. Both are important and should be dealt with.

As the Watt Committee report uses different figures based on last December's Health & Safety Executive's **Tolerability of Risk from Nuclear Power Stations** paper, they state that the maximum tolerable risk to a member of the public from industry is 1 in 10,000. Despite the dubious nature of this figure, if one takes into account the latest evidence on risk estimates from the A-bomb dosimetry re-assessment (**SCRAM 62**), the risk at 1 mSv becomes around 1 in 8,000 (ten times ICRP). On this basis even using the above figure for risk acceptability the risk is unacceptable. These comparisons also ignore the fact that if those exposed do not receive any economic benefit, then no risk can be said to be justified or acceptable.

Despite these contentious points, this report is important as it is the first time that anyone has admitted that members of the public can receive exposures of this magnitude around CEGB nuclear power stations.

Evidence from the Institute of Environmental Health Officers (IEHO) revealed at the **Radon Exposure in the UK** National Conference in Sheffield on 22 September shows that the problem of radon in houses is far worse than the Government and the NRPB claim (**SCRAM 61**). The Institute has carried out their own survey based on the homes of local authority officers, and as a result estimate that around 90,000 houses exceed the NRPB's action limit of 20 mSv per year. The NRPB estimate that 20,000 exceed the limit.

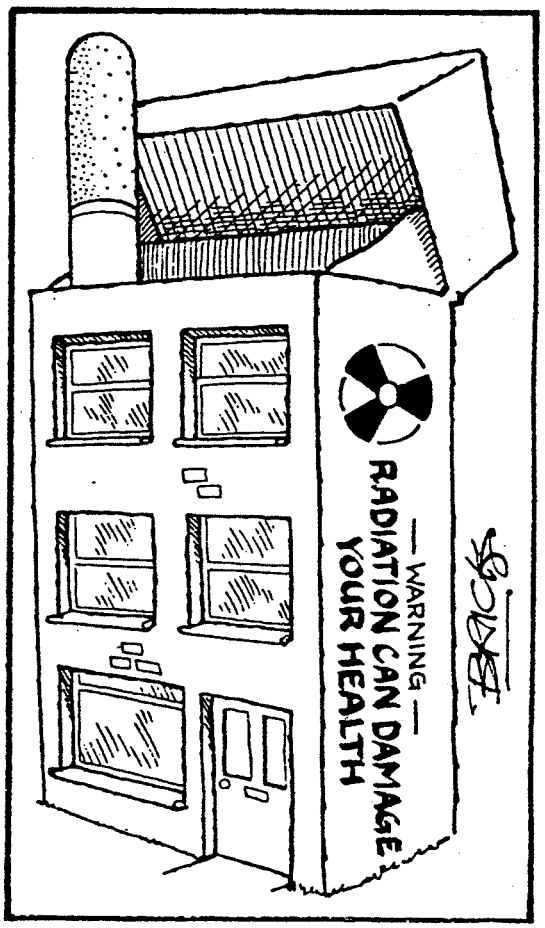
The Institute's survey was not confined to Cornwall and Devon, the areas previously known to be affected. They also state that the action limit is too high, and should be reduced to at most 10 mSv per year.

In the US, the Environmental Protection Agency (EPE) have recently announced that every home should be surveyed: they believe that 1 in 3 houses is affected. In terms of risk, the EPA have asserted that radon exposure increases the risk of lung cancer for a non-smoker to that of a smoker.

As a result of their change in risk estimates, the NRPB now estimate that radon causes around 1500 fatal lung cancers per year. Over a lifetime the excess risk is around 5%: an average smoker faces an increased risk of around 6%. However, the important difference between these two, in terms of Government policy, is that smokers are told to give up today, while people living in high radon houses are told that a couple of years further exposure will do them no harm.

To date, the Government have still not addressed the issue of whether they are prepared to offer grants for radon remedies: at present the house owner has to pay. The IEHO admit that if you live in a 'high radon' house which is privately rented there are no legal means that can be used to force the landlord to pay for corrective action.

In the USA, radon was an election issue, with both presidential candidates producing their policies on how the problem will be tackled. In the UK, the Government claim radon is a health problem, but characteristically, refuse to do anything about it.



PATRICK GREEN is Friends of the Earth's radiation consultant.

HEADLINES from the Hinkley Hearings

Objectors at the public inquiry into CEGB plans for a second Pressurised Water Reactor, Hinkley Point C in Somerset, have already won a concession by forcing the Board to compare the costs of coal and nuclear generation. However, they have so far been unsuccessful in securing a delay until the Government's electricty privatisation plans are more clear. This is important, as leaked correspondence suggests that the City is unwilling to invest in nuclear power. JAMES GARRETT has been following the procedures.

The public inquiry into plans for a pressurised water reactor at Hinkley Point in Somerset is taking place at a time when the electricity industry is in turmoil. The Bill to privatise the industry is due to be published soon. But until it is finally law, the industry will remain in a state of flux, with its future far from clear.

Opponents tried at the first preliminary meeting in the summer to have the inquiry postponed, at least until after publication of the Bill, as discussion would be difficult before the Government's intentions were clear. "It would have meant delaying it for a year, but then we don't accept the CEGB's argument that it is all so desperate," said Crispin Aubrey, joint co-ordinator of the umbrella opposition group, Stop Hinkley Expansion.

The inquiry Inspector, Michael Barnes QC, turned down the request but, say objectors, recent events have proved them right to press for a delay.

DoEn WITNESS RELUCTANT TO COMMENT

The Department of Energy's witness, Christopher Wilcock, was reluctant to be drawn on the detail of the Government's privatisation strategy, on the grounds that the Bill had not been published.

Further, Mr Wilcock, an under secretary and head of Electricity Division 'A', declared he was "responsible for all the Department's non-privatisation work on the electricity supply industry," but added he was concerned with "a number of specific privatisation matters including the development of policy in respect of the non-fossil fuel obligation."

Mr Wilcock also declined to comment on the highly sceptical report on the Government's privatisation proposals by the Commons energy committee. They stated, "In the future, electricity will be generated by natural gas, oil, coal, municipal refuse, methane, CHP, renewables and very possibly by new materials such as the bituminous emulsion ... There will also be more deliberate avoidance of waste through the promotion of more efficient energy use.

"For these reasons it is crucial that the Government's general support for a significant, and possibly expanding, nuclear component of energy supply into the next century should at all times be based on the most thorough and complete evaluation of the full costs of alternative energy sources and systems."

RECALLING WITNESSES MAY BE CONSIDERED

Mr Wilcock frustrated objectors again when all he felt able to say was, "I think we are now getting into the sort of recommendation area where I would prefer not to be drawn as I know that the response is under preparation and I also know it hasn't yet been approved."

The objectors may not get an answer to their question even when a reply has been made formally to the committee. The Inspector has only said he will consider recalling a government witness once the Bill and reply have been published.

In addition, Mr Barnes has refused a request by objectors that the inquiry should be adjourned, following the CEGB's announcement that they were putting on ice plans for a new coal-fired power station at Fawley near Southampton. The Board said they were shelving Fawley B because they were unable to guarantee that they could sell the power it would produce after privatisation.

"Why can't the same question apply to Hinkley C?" asked Mr Aubrey.

LEAKED DOCUMENTS REVEAL CITY MISGIVINGS

Documents leaked to the **Financial Times** show that both the CEGB and the City have serious misgivings about taking over nuclear power stations after privatisation - even as the Board are applying to build more.

CEGB Managing Director John Baker - due to be Chief Executive of the privatised National Power - said no contract would be signed for a UK nuclear power station unless the Government agreed to pass on the costs of nuclear power to the consumer. He wrote to John Guinness, Deputy Secretary at the Department of Industry, "The only contract which National Power and the distribution companies will be able to sign will be one in which both parties can have full confidence in the recovery of costs from their respective customers."

CBI Director General John Banham, made it clear in a letter to Cecil Parkinson that the City would not invest in electricity unless Mr Baker's demands were met. The risk of a serious accident was "unquantifiable, uninsurable in full, and not something which can be borne by a privately-owned company," said Mr Banham. "They can only be borne by the Government and the taxpayers, and we advocate that they should be after privatisation."

He added, "The decommissioning costs of existing nuclear stations are the other special risk which we think the public sector should continue to assume."

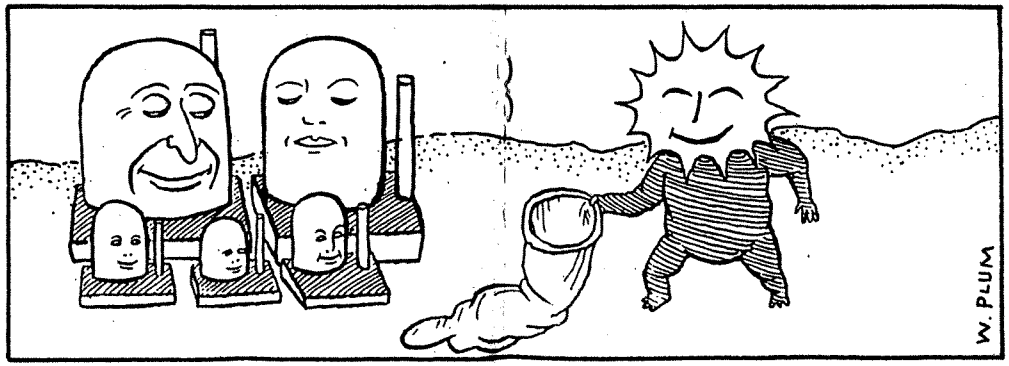
It hardly sounds like the free market operating. In a nutshell the CEGB and the City - neither of which would comment on the embarrassing disclosures - want the profits but not the risks and costs of nuclear power.

NON-FOSSIL FUEL FRACTION CRITICAL

There are other uncertainties about privatisation. The Department of Energy told the inquiry that the exact size of the non-fossil fuel fraction (NFFF) had yet to be determined. It is the NFFF which, according to the CEGB, dictates the need for Hinkley C.

Under the privatisation proposals released so far, electricity distribution companies would be required to contract for a fixed amount of electricity from non-fossil fuels. The Board and the Government both argue that renewable energy sources have only a tiny role to play, and nuclear power will provide the lion's share of the NFFF.

Mr Wilcock's statement put the present amount of nuclear and renewable capacity at 12.22 Gigawatts. He was asked by Gerard Ryan QC for the Coalition of Opposing Local Authorities: "Suppose there emerged in the inquiry an indication that some other figure might be preferred?" He replied: "That figure would obviously be treated with great consideration," and that "12.22 is not, as it were, set in concrete at this point."



NUCLEAR FAMILY PLANNING!

Mr Aubrey said, "It is a very unsettled period for the electricity industry and nuclear power, yet the CEGB are trying to pretend everything is cut and dried. The argument comes down to the CEGB saying government policy is solid as a rock, and the objectors saying it is all over the shop. For instance, one scenario is that the NFFF might be set so low in the Bill that no new company would feel the need to build Hinkley C."

LITTLE OFFICIAL FAITH IN RENEWABLES

Asked why he thought the inquiry had started at such an apparently inopportune moment, Mr Aubrey said, "They want to try to get a consent before privatisation is actually at a stage where the new companies are operating. We are still trying to get the Inspector to agree that when the Bill is published we should have another discussion about that at the inquiry. He is going to find it hard to resist calling back Mr Wilcock or someone from the CEGB to say how they interpret it."

Objectors have been highly critical of both the Government and the CEGB for placing so little faith in - and spending so little money on - renewable sources of energy.

Sam Goddard of the CEGB said wind, refuse and hydro power could all contribute economic electricity supplies by the end of the century, but the amount of power they produced would be small - only around, 1 Gigawatt by the year 2000.

Tidal power was ruled out altogether for the time being, said Mr Goddard, A barrage across the Severn Estuary could not produce electricity as cheaply as Hinkley C would. However, the Inspector has said he will consider calling an expert witness to give evidence about the barrage once the results of a detailed 18 months survey costing £4.26 million are published next year.

OBJECTORS WIN COAL COST COMPARISON

Mr Goddard said the Board were not prepared to fund basic research into renewables, preferring to get involved when the technology was at a commercial stage.

The objectors have so far scored one notable victory by forcing the CEGB to agree to provide comparative costings for energy produced by coal-fired and nuclear power stations. They believe the figures will come out clearly in favour of coal.

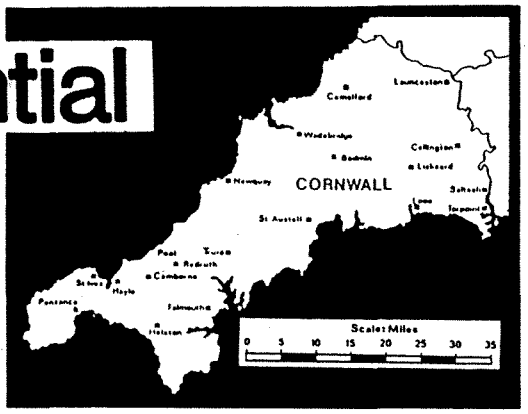
Gordon Mackerron for COLA told the inquiry that "nuclear power is unlikely ... to be as economically attractive as coal-firing."

The inquiry was scheduled to last 12 months when it opened. It is being held at the Somerset College of Agriculture at Cannington, six miles from Hinkley Point, already home for a magnox station and an AGR. Objectors can still register at any time during the inquiry, and 4,700 have already done so since it opened on October 4, making a total of some 17,500.

JAMES GARRETT is a freelance journalist.

For regular updates on the inquiry why not subscribe to the fortnightly **Hinkley Inquirer?** Send £12 for a year's issues to: **Stop Hinkley Expansion Office, Cannington Court, Church Street, Cannington, Bridgwater, Somerset TA5 2HA. Tel: 0278 652408.**

SW Power Potential



The Cornwall Energy Project was set up to produce an Energy Plan for Cornwall. This Plan covers prospects for energy conservation and opportunities for local renewable energy production, and will set out a 10 year programme of action (from 1990 to 2000) to achieve savings in energy use and the local production of energy; identifying prospects for new employment and business opportunities. JEREMY TRIDGEL reviews the progress.

The Cornwall Energy Project started work in February 1987 and has funding until February 1989 (SCRAM 62). The Project is sponsored by Cornwall County Council, Department of Energy, European Commission, Central Electricity Generating Board, English China Clay International and Shell plc, as well as Carrick, Cardon, Kerrier, Restormel and Penwith District Councils.

From an initial review of energy supply and demand patterns the Project is now looking at the opportunities for energy conservation and renewable energy development.

There are a number of different motivations behind the funding of the Project and what the sponsors are looking for the Project to achieve. A key reason for local funding is the prospect of new employment and business initiatives which will boost the local economy.

CONCERN FOR THE ENVIRONMENT

Cornwall is a clearly defined area, so a coherent local Energy Plan can be put forward - integrating conservation and renewable energy proposals. Cornwall's dependence on outside sources of energy leaves it vulnerable to interruptions; the development of local energy production can improve Cornwall's self-reliance.

Concern for the environment is important - the Structure Plan emphasises the need to maintain the physical character of the County. Energy conservation can lead to resource savings and reduce the impact of the energy supply industry on the environment. The development of renewables will have less impact than alternative conventional systems.

There is now a choice facing Cornwall in the transition from being an importer of energy to becoming a producer, and to facing some of the environmental costs. Cornwall is ideally placed for the development of renewables, and the Action Plan gives a vision to the choices now available.

The first steps have been to examine Cornwall's present energy supply and demand patterns. This takes 1986 as the base year, the latest year for which detailed statistics can be obtained.

Significant variations from national averages emphasise the importance of reviewing Cornwall's energy requirements independently. Gas use is about two-thirds of the national rate, which is offset by higher electricity and coal use.

To establish where this energy is used, detailed modelling of energy flows has been undertaken by Earth Resources Research. They looked at energy consumption by end use within various sectors. Where possible the work has been disaggregated using local information and databases, complemented by national figures where appropriate.

Table 1 shows energy demand within four main sectors. The domestic sector is the largest energy user in Cornwall, and it is in this area that energy conservation measures should be focused.

CONSERVATION AND RENEWABLES POTENTIAL

In housing there are several issues to face. Compared to the UK as a whole, many house are detached and have solid walls. Standards are lower in isolated rural housing, where open coal fires are widespread. Insulation is difficult, particularly with old wet walls in driving rain and chilling wind. There is however plenty to do in the post-war housing stock, upgrading poor insulation standards and putting proper controls on heating systems.

There is so much coal used in Cornwall that modern coal systems would by themselves bring major improvements in domestic energy use. From our Action Plan we now want to target relatively simple measures: cavity fill, loft insulation, draught-proofing and improved heating systems controls. A market for energy efficiency can only develop when many consumers are active and the first measures to be taken can only appeal because of their economics. By 2000 it should be possible to save £15 million a year, or 20% of the current energy bill of Cornish housing.

Cornwall's planners and economists are hoping for considerable growth in the Cornish service sector. A revived and reshaped tourist sector and a spread-

Table 1: ENERGY DEMAND IN CORNWALL

PJ/year	Coal	Oil	Gas	Elec	Wood	LPG	Total	%
Domestic	6.0	0.37	3.2	3.95	0.8	0.6	14.92	36
Industrial	0.5	4.33	2.7	2.85	-	0.3	10.68	26
Services	0.1	1.70	1.7	1.45	-	0.3	5.25	13
Transport	-	10.20	-	-	-	-	10.20	25
Total	6.6	16.6	7.6	8.25	0.8	1.2	41.05	100
%	16	40	19	20	2	3	100	

Original units:

Coal	200,000 tonnes	Oil	438 million litres
Gas	72 million therms	Electricity	2270 GWhours
Wood	50,000 tonnes	LPG	litres & kg

NB: PJ = 1,000,000,000,000,000 Joules

ing of southern affluence (it must never be forgotten that Truro is as far from London as Newcastle is!) is expected to lead to employment (and therefore energy use growth). This growth would be a good vehicle for change in energy utilisation. If energy efficiency standards could be raised we expect that an extra £5 million would be saved.

Energy management systems are well advanced in schools, and government buildings are reasonably well controlled. However, more investment is required, and the public sector has a role to play in forging the infrastructural components of the energy service industry that can persuade the other 15,000 small energy users to change their inefficient ways.

Table 2: RENEWABLE ENERGY POTENTIAL FOR CORNWALL

Energy Source	Resources	Likely areas & possible projects	
Wind	1500MW	CEGB Cold Northcott	8MW
		Delabole	3MW
Hydro-electricity	18MW		
Solar		Conservatories	
Biomass	140MW	Fuel wood	
		Cow manure for methane	300kW
Waste	50MW	Utd Downs Landfill	3MW
Tidal-barrage	160MW	Hayle, Padstow, Fowey	
Tidal-stream	45MW	off Cape Cornwall	
		off Lands End	
		off Lizard	
Geothermal	1000MW	Utd Downs - Horticulure power station	
Wave	large	on-shore (eg Islay)	

NB: Cornwall uses about 1300MW of energy continuously in the form of coal, electricity, gas and oil.

Energy efficiency must now be promoted through the development of energy service companies independent of the providers. This role is developed with control and technologies, intelligent metering, monitoring and targetting, and contract energy management down to the smallest firm.

Our modelling work has highlighted two significant facts about Cornish industrial energy use. Mining and extraction uses predominate - motors (drives, pumps, conveyers) account for over half of industry's energy costs. Space heat is the other target - 25% of energy is taken for this purpose.

There is nothing new in all this. What is new is the local focus, with the authority of local government behind it. The decisions are still going to be made by the thousands of individual consumers, but if our European partners can stimulate a market for energy efficiency it seems that we have the opportunity to do likewise. A report for Cornwall sitting on a desk won't save any energy.

BAND-WAGON EFFECT

It is hoped a band-wagon effect will emerge. New lighting and central heating, therefore energy efficient new lighting and central heating. All elements of the delivery need to be energy efficiency conscious though. The electricity and gas companies have a long way to go before they can represent the movement towards energy efficiency.

A case in point is Combined Heat and Power (CHP). Difficulties can emerge when connecting with the grid; and then, if it's a gas engine, the gas company may change the tariff. It's difficult to see why CHP isn't in everybody's interest, yet our current energy market finds it hard to support its efficient use.

The renewables present a different challenge. The peninsula has one of the greatest chances of providing power from renewables. Our assessment of the potential for the peninsula is given in **table 2.**

A realistic target for 2000 might be 150MW installed of wind power. This would supply a tenth of our electricity needs or 4% of our energy requirements. But realising this really needs enthusiasm. As wind becomes more and more 'economic', the barriers to large-scale adoption lie in it's environmental impact. Cornish hearts and minds have yet to be won, when images of Californian desert windfarms compete with more sensitive and aesthetically pleasing Danish solutions to siting problems. However, a national opinion survey in summer 1988 found that half the population would agree to a windfarm near them, compared to less that a twelfth for a nuclear station.

Noisy machines could be a problem as the countryside is very quiet. The local 145kW turbine is amongst the quietest. It is ironic that Cornwall debates these environmental issues in the context of having over 90% of its electricity supplied from nuclear power stations.

AIM TO GET RENEWABLE TECHNOLOGY MOVING

The real aim is to get the renewable technologies moving. Renowned for their ability to decide and move on projects "dreckly", the Cornish are well placed to exploit the genius of their innovative and independent traditions in engineering and independent power generation. We had steam engines for mines nearly two hundred years ago, and electric lights from a windmill in 1892!

Projects under discussion include far more use of hydropower from rivers and smaller sources of water, biofuel developments on the land (a bigger wood market) and extracting energy from the waste stream, both human and household. Some of the projects need further developments in technology before they become truly economic. For many that are currently economic, such as the digestion of sewage, there needs to be a change in vision at the top to ensure exploitation. With Cornwall's renewed focus through the Plan we aim to take these ideas out and put them through to implementation.

Cornish waves are famous the world over with surfers. The Energy Technology Support Unit suggests that onshore wave energy devices may not work in our relatively high tidal range. The practical experience of the Norwegians could be built on the solve the problem here in Cornwall.

The present Hinkley C inquiry throws the issues into sharp relief. Will nuclear pre-empt renewable energy developments? We aim to see that it does not.

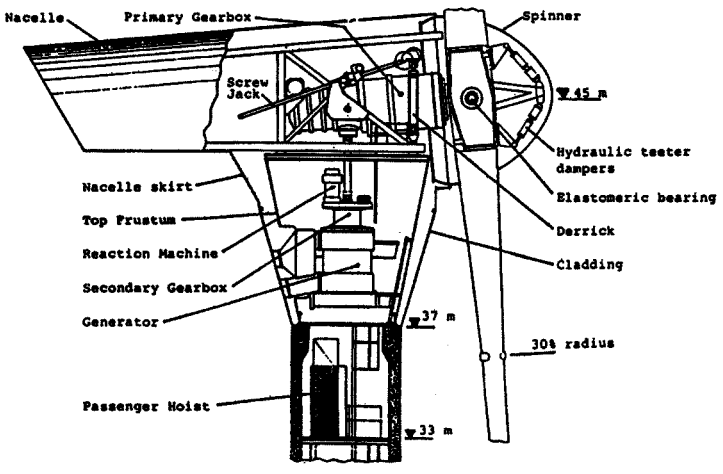
JEREMY TRIDGEL is a member of the Cornwall Energy Project management team.

Turbines for Tomorrow

Commissioning of the Orkney 3MW wind turbine is now well advanced, with prolonged operation at full power achieved for the first time in mid September. TONY BURTON outlines the design, construction and commissioning of the world's largest operating wind turbine, and looks forward to the future.

The concept of a 60 metre diameter horizontal axis wind turbine first took shape during the initial design studies commissioned by the Department of Energy between 1977 and 1980. Development of a detailed design began the following year. Investigations indicated that large wind turbines could potentially generate economic electricity, so the decision was taken to build a first machine to demonstrate technical feasibility. Manufacturing and construction began in early 1985. The Wind Energy Group, a joint venture of British Aerospace, GEC Energy Systems and Taylor Woodrow Construction have carried out machine design, construction and commissioning.

For a wind turbine, potential energy capture rises as the **cube** of the annual mean wind speed, so there was a strong incentive to select a site with a high wind speed. The highest wind speeds in the British Isles occur in Orkney, Shetland and the Outer Hebrides and a site on Orkney was chosen because of its relative accessibility to the mainland. The choice of an island site inevitably had a marked influence on the design, which has been arranged so the major components of rotor, primary gearbox, generator and brake can be removed for maintenance/repair without the prohibitive expense of a hired-in crane. Accordingly, the nacelle has its own built-in derrick which was used for the installation of both the primary gearbox and the rotor.



General arrangement at the top of the tower

The rotor is 60m long from tip to tip and is constructed of a tapering steel hollow box with fibre glass mouldings forming the leading and trailing edges of the aerofoil section. It weighs 65 tonne. Control of rotor starting and shutdown is by pitching the 9 metre long tips with hydraulically operated jacks. For shutdown the tips are held at 90 degrees to the fixed rotor blades, but during running in medium winds they are maintained parallel with the blades. In winds above about 35 mph the tip pitch angle is varied to limit the power generated to 3MW. During normal running, the pitch angle does not control the rotor speed - it is held close to 34 rpm by the generator at the other end of the drive train.

The drive train consists of the primary gearbox, high speed shaft and secondary gearbox. The **epicyclic** primary gearbox performs the dual function of supporting the rotor shaft and stepping up the drive speed by a factor of 32.3. It incorporates a bevel gear so its output can drive the vertical high speed shaft connection to the secondary gearbox.

The main brake is mounted at the rear of the primary gearbox, and acts on the shaft driving the bevel gear. It consists of eight large rotating discs which can be pressed against intervening stationary discs by air bags to stop the rotor should both tips fail to pitch to perform a shutdown.

The primary gearbox and brake are housed in the nacelle - a long cylindrical enclosure with the axis at 5 degrees to the horizontal immediately behind the rotor hub.

The secondary gearbox is primarily a **differential** gearbox - there is only a small speed increase from the high speed shaft to the synchronous generator. This gearbox permits a variable speed motor - the **reaction machine** - to drive a side shaft at a steady torque and thus allow the rotor speed to rise and fall slightly in response to gusts and lulls in the wind while generator speed remains fixed at the 1500 rpm determined by the grid. The resulting smoothing of drive train torque leads to delivery of steadier power to the grid.

The secondary gearbox is mounted on top of the generator which is supported vertically in the tower top. The tower is a 3.8m diameter prestressed concrete cylindrical shell, tapering to 9m diameter at the base and surmounted by a thin walled steel frustum housing the generator and tapering out to support the 5.5m diameter tower top bearing rings. The nacelle rests on this bearing ring on four low friction pads, and can be rotated by the yaw drive so that the rotor faces into the wind. Three large horizontal wheels on the underside of the nacelle maintain it central with respect to the frustum.

The yaw drive motor is rated at 3KW, but is capable of rotating the 66 tonne nacelle with the 30 tonne primary gearbox, 7 tonne brake and 65 tonne rotor through 360 degrees in 36 minutes. The yaw drive gearbox drives a pinion which engages with pins on the outside of the steel frustum. A wind vane on a separate mast detects misalignment of the nacelle to the wind and causes the yaw drive gearbox to operate as appropriate.

MAJOR TRANSPORT OPERATION

The concrete section of the tower was constructed in the summer of 1985 by the jump form method - the formwork panels are leap-frogged upwards as pouring proceeds. The following summer a major transport operation was mounted to bring the frustum, nacelle, generator and primary gearbox to Orkney, together with a very large crane. A vessel

was especially chartered to carry the nacelle and frustum from Fleetwood and Aberdeen respectively, while other items travelled by regular ferry from Aberdeen. The jib and counterweights of the Demag TC2000 crane filled twelve 40ft articulated trailers!

After preassembly work at ground level, the frustum (with generator) and nacelle were erected within two weeks of arrival. Lowering of the nacelle onto the frustum was a delicate operation because of tight clearance, and required the use of four hand operated winches for guying purposes.

After commissioning the nacelle derrick, the primary gearbox was lifted, swung in and onto its mountings. Meanwhile, trial assembly of the rotor was underway at British Aerospace's workshops at Hatfield, including initial commissioning of the tip pitch hydraulic control system, and structural testing. The rotor is constructed of five major sections - the 18m long central section with hub and inner blades, the two 12m long outer blade sections and the two 9m long tip blades. Following testing, the rotor was broken down into these sections again for transport to Orkney, and reassembled there on a buttress mounting at the base of the tower in May 1987. After redeployment of the derrick, the rotor was hoisted into position and bolted to the shaft of the primary gearbox.

SYNCHRONISATION AND COMMISSIONING

Once electrical connection had been established, rotational testing began and continued at steadily increased speeds through the winter to confirm satisfactory performance of the tip control system and other sub systems, including braking and lubrication. First synchronisation to the grid was achieved on 9 February 1988, and since then commissioning trials have proceeded at increasing power levels, wind permitting, until 3MW was generated for the first time in September.

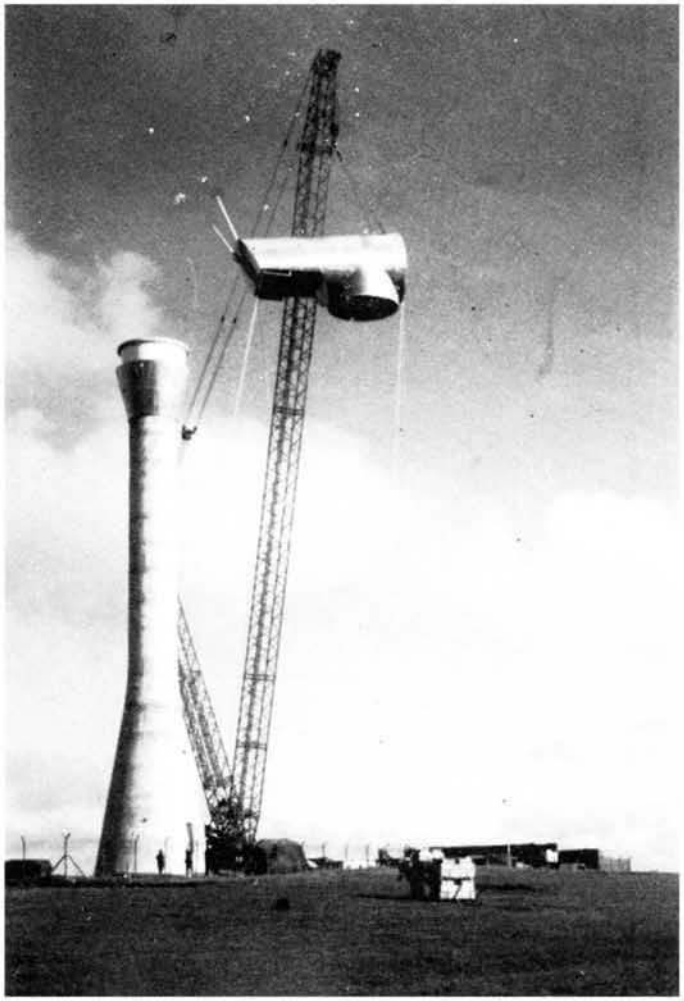
As is perhaps inevitable in the commissioning of a piece of equipment as innovatory as the 60m diameter wind turbine, many unexpected problems have arisen and demanded solution along the way: the achievement of 3MW generation has taken significantly longer than envisaged. Further work is currently in progress to eliminate some of the obstacles to unrestricted, unattended operation which became apparent during commissioning trials.

An example is the automatic yaw control system which was intended to utilise wind direction signals from vanes mounted on masts at the rear of the nacelle. This method had been tried and tested on the 20m diameter forerunner of the 3MW machine, but has proved unworkable on the larger machine at low wind speeds because of the near stationary air at the rear of the nacelle. Accordingly it has been necessary to set up a wind vane on a separate mast several hundred metres from the wind turbine and rewrite the computer software to compute the required yaw correction from the difference between wind direction and nacelle orientation. Until this new system came into operation, manual yaw control was required.

FUTURE PROSPECTS

Once sustained trouble-free operation has been demonstrated to the satisfaction of the client, the North of Scotland Hydro Electric Board, they will fully take over the running of the machine. Evaluation of the machine's ability to deliver its design annual output of 9GWhr (9 million units) will then begin.

The prospects for large diameter wind turbines depend on the predicted cost per unit of electricity generated. Based on its £12m capital cost and 9GWhr design annual output, 20 year design life and 5% discount rate, the cost per unit works out at about 10p. The cost of a prototype is inevitably a high one because all design cost and costs of special tooling are loaded onto a single machine, but the actual costs incurred provide a sound basis for estimating the reduced costs achievable with series production.



Nacelle erection with Demag TC2000 crane

Since construction began, impressive reductions have taken place in the cost of medium sized (25m diameter) wind turbines - not least because quantity orders have realised the benefits of series production. With the cost of energy from medium sized machines being quoted at about 2.5p/unit, the perceived cost advantage has shifted firmly away from large diameter machines for the time being, but this may reverse as wind power expands and series production of large machines becomes feasible. This is because there is a trade-off between the higher rotor costs of larger machines and higher maintenance, control, electrical connection and site access costs of smaller machines - reckoned per unit of output in each case.

TONY BURTON is Site Engineer for the Wind Energy Group's Orkney 3MW Wind Turbine.

Global Energy Strategies

The End-Use Orientated Global Energy Project (EUOGEP), an independent international research group, have spent the last ten years examining world energy systems. MIKE TOWNSLEY outlines their work, and suggests that rather than being a stick with which the North can beat the South, the rich the poor, humanity the environment, energy can be used as a positive tool for solving some the world's basic problems.

Industrialised nations take energy for granted. We expect lighting, heating and cooking to be available at the flick of a switch. But, do we ever stop to consider the plight of the three quarters of the world's population who have no such luxury?

Some 100 million people suffer from acute fuelwood scarcity, and a further billion have a fuelwood deficiency, according to the United Nations Food and Agriculture Organisation. Three quarters of the world's population live in developing countries, but account for only one third of world energy consumption. This comparison does not, unfortunately, mean developing countries use energy extremely efficiently, but instead gives a rough guide to the degradation suffered there.

By examining energy end-use, we can introduce improvements in energy efficiency which would significantly raise the living conditions of the developing world.

Although the approach is not new, EUOGEP have applied it with rigour to the whole gamut of global problems. The result is a guide for survival, but not a blueprint.(1) As the authors stress, each nation is different - geographically, culturally and politically - and therefore any strategy must be tailored to their particular needs.

FUELWOOD USE

Women in developing countries get the short straw: it is they who spend large amounts of time, with their children, foraging for fuel wood. This leaves little time for education - yet education would improve their lot, for example in birth control and hygiene.

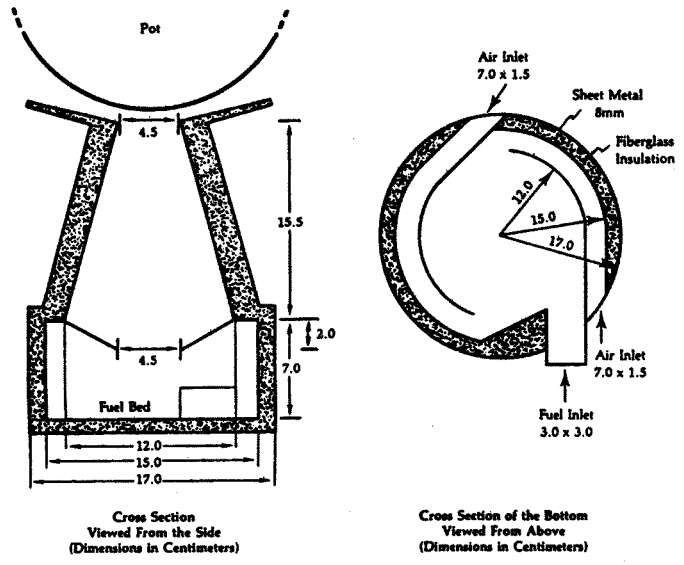


Diagram of Bangalore high efficiency wood stove

Primary energy use is in cooking and heating. By introducing the latest, energy efficient, wood burning stoves their problems can be reduced quite significantly. A stove recently developed by The Indian Institute of Science at Bangalore halves fuelwood requirements and costs only $5. A shift towards biogas or natural gas fuel can increase such gains: they are typically over 50% efficient compared with 40% for the best wood stoves. Finance for such improvements can be written off against reduced imports of fuel. This will have a sustainable effect.

Such a move would not only free women and children from some of the drudgery of wood gathering, but would also reduce deforestation and the subsequent desertification. It also helps to combat the greenhouse effect.

An annual investment of $1 billion would provide efficient fuelwood stoves to all the 400 million rural households of developing countries, assuming each stove costs $5 and lasts 2 years on average. This would result in massive savings of fuelwood, roughly equivalent to the output of 80 large nuclear plants costing $160 bn.

BIOMASS DEVELOPMENTS

The report highlights the applicability of biomass for developing countries. Brazil's alcohol programme produced about 11 billion litres of ethanol from sugar cane in 1985 and directly generated about 475,000 full time jobs in agriculture and industry, along with a further 100,000 jobs in secondary sectors: commerce, services and government. It required an investment of between $6,000 and $28,000 per job, compared to an average of $42,000 for their conventional industrial sector, and $200,000 for their oil refining/petrochemical complex at Camarcari.

The programme is extremely cost effective: the ethanol costs approximately $50-56 per barrel of gasoline displaced, when subsidies are removed, and dramatically reduces Brazil's oil imports and associated foreign exchange requirements, displacing 55% of the gasoline requirements for 1986.

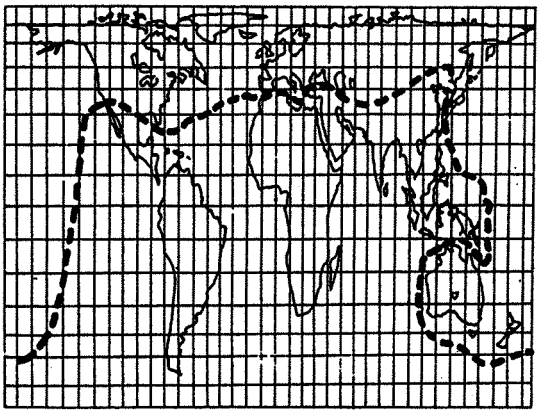
Biomass is widely available in rural areas, and is ideally suited for conversion to fuel on a small scale. Both features would promote rural industrialisation, creating jobs where they are most needed.

By 2020 developing countries could enjoy a standard of living equal to that of the industrialised nations in the 1970s, but using about 1kWyear (approximately 8,700 units) per capita - roughly the same as their present consumption.

WORLD OIL DEPENDENCE

Oil underwrites the industrialised world. Developing countries are being forced into the same position. Many development loans from international banks are conditional on purchases of technology from industrialised countries. When oil starts to run out, supplies to the developing nations will be cut first. However a precursor to a cut-off is higher fuel prices - the developing world will be forced to redirect funds from development budgets to meet

the price rises. Following the conventional fossil and fissile fuel path will only lead to greater chaos. The developing world needs to follow a sustainable, indigenous, energy path, the first step of which is energy efficiency.



The North-South Divide (Peters Projection)

EUOGEP believe this global dependence on oil is the single greatest threat to global security, closely followed by the spread of nuclear power and its attendant proliferation risks.

Both the USSR and the USA rely upon the Middle East for significant quantities of oil: "The umbilical cord of the free world runs through the Strait of Hormuz and into the Persian Gulf, and the nations which surround it," warns former US Defence Secretary, Casper Weinberger. EUOGEP's opinion is supported by the US placing their nuclear forces on alert following the USSR threat to intervene in the 1973 Arab/Israeli war. The US now have a contingency plan for dealing with threats to Middle East oil supplies: a rapid deployment force which could occupy strategic areas in the region or confront any 'hostile' expeditionary forces. Clearly this risk could be lessened by reducing dependence on oil, through energy efficiency backed by a renewable energy development programme.

Opportunities for energy efficiency in all sectors and all countries are considerable. It is possible to cut per capita energy use in industrialised countries, by over half, from 4.9kWyears (1980 level) to 2.4kWyears, by 2020, whilst continuing economic growth and increasing per capita Gross National Product by 50-100%. This should appeal to Mrs Thatcher who, in reply to the Bruntland, report "wholeheartedly endorsed" the concept of sustainable development.

Political bias must be swept away - subsidies for conventional and nuclear energies make it impossible for energy efficiency and renewable energies to compete in the 'free market'. The market must be truly freed. EUOGEP are extremely wary of bureaucracy's ability to administer the required changes, a view supported by the presence of black markets wherever bureaucracies exist. It would, in their opinion, be better to tailor the 'free market' by limited state intervention. In many cases such intervention would only be necessary to counter interventions of the past.

HIGH DEMAND SCENARIOS

A sustainable energy environment inevitably involves transition to renewable energy sources, and greater spending on their development. The group point to biomass, wind power and solar energy as offering great hope for such a future. The rapid development of solar cells, despite their current poor funding, must indicate a significant role for them in future energy strategies.

Conventional strategies, such as those of the International Institute for Applied Systems Analysis (IIASA)(2) and the World Energy Conference(3), give renewables only a token role. Both studies produced high and low scenarios. Their high scenarios forecast a near trebling of energy consumption between 1980 and 2020; the low scenarios are almost as bad - a doubling in the same period. The EUOGEP scenario yields an increase of only about 10%, from 10.3TWyears to 11.2TWyears. Both conventional studies also promote a future where the industrialised nations' consumption per capita is at least six times that of the developing world. The EUOGEP future would see developing countries increase their share of energy consumption to two thirds.

The IIASA study is closest to the opinion held by most energy planners: one new 1000MW nuclear plant every four to six days, and new fossil fuel production capacity of 2 million barrels oil equivalent per day every one to two months, from 1980 to 2020 will be required to meet predicted demand.

The costs of such an expansion, which would almost certainly put the OPEC cartel back in the driver's seat, in terms of global security and the environment, would be simply unbearable.

Unfortunately, EUOGEP do not include a planned phase-out of nuclear power stations - they merely envisage no nuclear expansion beyond that planned for the end of the century. However, their work relies on proven or near proven technologies, and does not account for any future developments. As research and development in renewable energy technology is in its infancy there is considerable scope to displace the nuclear component in the future.

Although EUOGEP's low demand scenario, reducing the contribution of fossil fuels to around 20%, would not solve the greenhouse effect, they say it would buy time to either develop acceptable alternatives, or to adjust to the changed global climate. They are optimistic that acceptable alternatives could be found and cite solar cells linked to hydrogen fuel cells as one such alternative.

Concluding, developing nations have an advantage over the industrialised world: the opportunity to avoid the mistakes of over-dependence on fossil and fissile fuels and their attendant hazards. But they need to be protected against the wishes of greedy multinationals, and governments, who are trying to force them into mimicking the industrialised world's inefficient, wasteful and perilous system.

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1 **Energy for a Sustainable World** by the End-Use Orientated Global Energy Project. Wiley, 1988. 517pp, £34.50. (comprehensive & academic, very well referenced). **Energy for a Sustainable World** and **Energy for Development** from World Resources Institute, 1987. 119pp, £5.95 & 72pp, £6.95 respectively. Available from 3rd World Publishers, tel: 021 773 6572. (very useful simplified accounts)

2 **Energy in a Finite World - A Global Systems Analysis.** IIASA, 1981.

3 **Energy 2000-2020 - World Prospects and Regional Stresses.** World Energy Conference, 1983.

Wave Motion

An all party group of MPs are demanding that the Government institute an inquiry into allegations that a report leading to the demise of wave power R&D was altered before being submitted to the Department of Energy, by the Energy Technology Support Unit, for evaluation (SCRAM 67).

The call made in an Early Day Motion sponsored by Frank Cook MP (Lab), vice chair of the Parliamentary Alternative Energy Group (Parligaes), also has the support of Parligaes chair, Tony Speller MP (Con).

An inquiry into the "activities of ETSU," should be held before the Energy Secretary places the Government's plans for privatisation of the electricity supply industry before parliament, argue the MPs.

After privatisation, 20% of electricity must generated by non fossil fuelled means. Renewable energy and nuclear power will be in direct competition to fill this quota. The strong links between ETSU and the UKAEA will therefore represent a serious conflict of interests.

With particular reference to the doctoring of a report on the Salter's Duck wave power device, the motion expresses the opinion that ETSU "must have had some reason for colluding in such a distortion," and recalls "that this is not the first time that ETSU's standards of clinical detachment and technological evaluation have been brought into question."

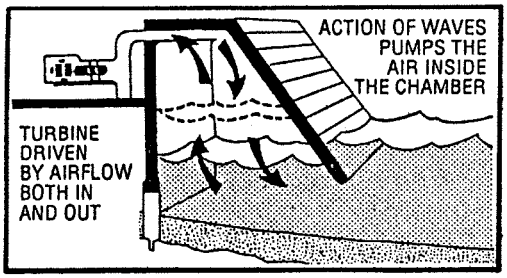
Although the motion is unlikely to succeed in gaining the necessary inquiry, it serves notice to the Government that their disregard for environmentally benign energy sources, and blind allegiance to the nuclear industry, will not be tolerated for much longer.

Moreover, the motion is only the first of many parliamentary actions to promote a sane energy policy.

Wave Survey

An application for a grant to study the British coast to find sites for wave power devices has been made by Trevor Whittaker, the architect of Britain's only on-going wave power development project, to the Department of Energy.

Whittaker wants £80,000 to explore our coast for sites capable of housing stations like the prototype his team from Queens College, Belfast University, are installing on Islay (SCRAM 61).



From preliminary studies, Shetland is being promoted as one of the finest places in the world for wave power; Whittaker comments, "We are looking at an average power of 70MW per kilometre of coastline, on the west side of Shetland."

Island communities represent the perfect opportunity for installing wave devices because it is invariably too expensive to connect them to the grid. The Islay machine, a 40kW prototype, capable of producing enough electricity for a small village, is expected to generate electricity costing 6-7p/kWh. However Whittaker believes that, in the long term, mass produced 1MW or 1.5MW machines could yield unit (1kWh) costs of 3-4p. The cost of the diesel generated electricity from the Hydro Board is 6p/kWh.

It has also been suggested that the Government should encourage the extremely successful Norwegian wave power company Kvaerner to explore the wave potential of the British Isles. Kvaerner now have a major interest in the Clyde shipyard.

Small Hydro

Previously unexploitable, low-head, hydro sites could now provide economic electricity, according to a team from Coventry Polytechnic (SCRAM 66).

Their device, a spin-off from wave power work conducted in the '70s, makes it possible to harness the power of sites where the head is below 4m.

After operating a 150kW prototype for the past year, the team have applied to the European Commission for a £1 million grant to build a full scale, 1MW, demonstration station at Ratcliffe on the river Trent.

Professor Norman Bellamy believes that a commercial design could produce power at 1p/kWh.

Enquiries concerning the design have been received from all over the world. However the Coventry team and Hydro Energy Associates, who are backing the project, plan to wait until a commercial scale version has been built and operated before exploiting the considerable world market.

Danube Blues

The Hungarian Parliament has voted to continue building their side of the controversial Gabcikovo/ Nagymoros Danube Barrage scheme despite massive popular opposition (SCRAM 67).

Out of 380 MPs only 40 voted against the scheme the Hungarian Prime Minister, Karoly Grosz, who has previously spoken in favour of the proposal was one of the 13 abstentions.

Parliament's decision came as a severe blow to the country's environmentalists, who one month earlier staged the largest demonstration seen in Hungary since the popular uprising of 1956. Although a similar demonstration in 1986 was broken up by police, this demonstration was granted official permission.

Amongst the many placards held aloft in protest one written in English was directed at the Prime Minister: "Engineer, Politician. Hungary is not a playground, [it] is not Legoland."

If Hungary had refused to complete their side of the scheme they would have been liable to pay massive compensation to Czechoslovakia, who are near to completing their side. They would also have to meet the cost of restoration work of the construction site. Given their hard currency debt of over $18bn, such a move would be economic suicide.

Deputy Prime Minister, Peter Medgyessey, admitted that the project was a mistake, but said abandoning it would be more expensive than completing it.

CEGB Wind Centre

Wind energy could save up to one million tonnes of coal by the turn of the century, according to Lord Marshall at the official opening of the CEGB's Wind Energy Demonstration Centre at Carmarthen Bay.

The Centre was opened by Baroness Hooper, the new under secretary of state for renewable energy, who, wasting no time in espousing the lore of privatisation, claimed that the "sell-off would spur on the development work to harness renewable energy sources."

The Carmarthen Bay site, formally the home of a CEGB coal fired power station and their first wind turbine, now dismantled, boasts four wind turbines: a 300kW Howden horizontal axis machine; a small Balfour Beatty turbine; and two Wind Energy Group turbines - a 300kW horizontal axis machine and a 130kW vertical axis machine.

It is the CEGB's intention to use the Centre to test wind turbine designs for their proposed demonstration windfarms, and also to gauge the public reaction to wind turbines.

"As chairman designate of the generating companies known as Big G, I shall be paying great attention to the development of this new technology," said Lord Marshall.

However, the Board were unable to tell SCRAM who will own and run the Demonstration Centre, or for that matter who will build and run the experimental windparks, post privatisation. A spokesman for the Board said that no decision had yet been reached on who will take the proposals forward, and stressed that there is a difference between "feasibility studies and actually carrying out a project."

The industry is not being so carefree about the future of Hinkley C, which will, if built, be run and owned by Big G.

Windpark Siting Discord

Meanwhile the Board's choice of a site in the North Pennines, an area of outstanding natural beauty, for one their windfarms, is fast becoming the focus of environmental objections to windfarms.

When the Board asked the Countryside Commission (CC) to comment on their list of prospective sites, the North Pennines was marked as the most environmentally sensitive. Although the Board's other named sites, in West Wales and Cornwall, were at the bottom of the Commission's list, they believe windfarms in these areas could be "locally disastrous." The CC will oppose the development of the North Pennines windpark.

The Council for the Protection of Rural England (CPRE) have also expressed dismay at the choice of the North Pennines, and echo the thoughts of the CC in promoting the development of offshore wind turbines.

Whilst most organisations are in favour of increased use of renewable energy sources, it seems they are not so much in favour of the electricity industry. Fiona Reynolds of the CPRE sums up the attitude of environmentalists: "The CEGB has shown little sensitivity in the past and has not shown itself to be particularly flexible."

Farmers in Cornwall are also distressed by the CEGB's windpark proposal. Dave Parsons, chair or the Cornish branch of the National Farmers Union, is highly critical of the Board, and comments, they cannot carry out their plans "without a great deal more consultation and discussion." He plans to seek legal advice on the rights of local farmers from the NFU's legal team.

The title of a recent article in Wind Power Monthly hit the nail on the head: "Enemy is CEGB Not Wind Power, Say Environmentalists."

Offshore Wind Site

As if in anticipation of environmental objections to onshore wind turbines, the CEGB have announced the site of their offshore aerogenerator: three miles off the coast near Wells-next-the-Sea in Norfolk.

Offshore work is being conducted because, "it is uncertain whether land-based windparks would be on a large scale would be publicly acceptable, the offshore option is being studied by the CEGB and the Department of Energy," according to the CEGB's latest leaflet on wind power.

The turbine will be a 700kW, vertical axis Howden machine, mounted on a steel tripod piled into the seabed. Preliminary drilling to survey the seabed will begin next spring, and it is hoped that the turbine will be producing electricity in the early 1990's.

It will be interesting to see how the Board plan to bring the electricity to shore. The obvious method would be to use a submerged power cable. SCRAM hope the events which led to the run-down of the UK wave power programme will not be repeated in the case of offshore wind power.

Offshore wave power also requires submerged power cables. Their reliability is a crucial to the economics of any off-shore power system. In a report on the viability of the Salter's Duck wave power device, Rendel Palmer and Tritton, the prestigious engineering consultancy, continuously altered their figure for the reliability of such cables, expressed in terms of 'years kilometres per fault'. RPT's figure fell from 300 to 1.

They did however admit the 1 was a 'typo', and should have been 10. Curiously, the Norwegian company Kvaerner, who are selling oscillating water column wave power devices all round the world, quote a figure of over 600.

Perhaps the CEGB would do well to contact Kvaerner.

Wind/Diesel Plans

The South West Electricity Board intend to install 30MW of wind/diesel generating sets over the next 7 years.

Their decision is based on a report of the area's wind resource, conducted by Geoff Williams of Windpower & Co, who estimated that Cornwall alone could produce 1.2GW from medium sized wind turbines.

Not only did Williams conduct the survey, but he will be supplying the wind turbines. Williams' design has been chosen because "it is a quiet runner and its size makes it unobtrusive on the landscape," according to Geoffrey Hoyland of SWEB. It also has the advantage of by-passing the planning restrictions for machines of 300kW or above. SWEB have also purchased electricity from the Williams prototype for the last two years.

Combining the wind turbine with a diesel gen-set will enable the system to provide firm power to the grid, and can be used as base load supply.

Prospective sites for the turbines have not yet been announced.

Acid Rain

The full cost of meeting the European Directive governing reductions in sulphur dioxide emissions from power stations will be almost double the original estimate of £1.7 billion, according to a report commissioned by the Department of the Environment (DoE).

The study, conducted by Technica, assumes that the Board will build its 'small family' of five PWRs, by the end of the century, and will fit all new coal-fired power stations with desulpherisation equipment. Their calculations on a growth in electricity demand of 1.5%, less than the Board's prediction is 1.7%. It concludes, "To meeet the 60% reduction implies fitting clean-up equipment plant with a capacity of 29,000MW. This is effectively all the CEGB's coal fired power stations.

"With only a modest increase in electrical energy consumption, the DoE targets for pollution abatement will not be met ... there is a divergence between stated policy and achievable objectives," comments the report's author, Philip Comer.

Any expansion in retrofitting clean-up technology will be borne by the Board's private successors.

● Meanwhile, less than a fortnight after announcing the £400m first stage in their £1.7bn clean up programme, the CEGB's environment director, Dr Peter Chester, told the British Association: "It already seems clear that urgent reductions in the emissions from power stations will not bring the hoped-for cure."

If the Board's environment director has evidence that their stations are not to blame, he should inform his chairman. Lord Marshall said, in the Board's latest video on acid rain: "We're now satisfied that, through a complicated process, sulphur emissions are effecting the rivers, and therefore the fish, in Scandinavia."

A conference, held last month in Edinburgh, with a panel of internationally respected scientists, also confirmed that the finger of blame does indeed point to power stations.

Greenhouse Effect

An American Company, are to plant 52 million trees in Guatemala, to counter the release of carbon dioxide from a coal fired power station they plan to build in Connecticut.

The company, Applied Energy Services, will contribute $2 million to the international relief and development agency CARE, to negate the addition to the greenhouse effect from the plant.

The cost of the planting will be less than 1% of the cost of the station. Over its 40 year life, the station will emit 387,000 tonnes of CO_2 annually, and AES estimate the trees will absorb at least that much from the atmosphere. AES Chief Executive, Roger Sant said, "This is one way for us to be environmentally responsible global citizens."

The project will take 40,000 farmers over ten years to complete, and give Guatemala a valuable fuelwood resource.

SCRAM wonders if the CEGB will organise similar projects in the developing world to counter the effects of their planned new coal fired power stations.

Hinkley Objection

The Energy Technology Suport Unit have warned the Cornwall Energy Project (CEP) "against being drawn into the fray," of the Hinkley Point C inquiry.

The Project, whose interm report outlines ways in which Cornwall could become energy self sufficient (see p16-17), will not now be attending the inquiry. The CEGB's original justification for Hinkley C was to help bridge future gaps in supply to the South West: Cornwall.

CEP first recieved a letter from ETSU regarding the Inquiry in July, which warned against becoming involved. However up until a few weeks ago CEP's scientists were still prepared to deliver their evidence. They have now, however, reluctantly withdrawn - it had been drawn to their attention that their appeal for continued funding would be processed at the same time as they were presenting their evidence.

The Department of Energy claim that although the letter was also circulated to the Project's other sponsors, it should not have been considered as a threat.

However, as all of the Project's work, including their interm report, has been placed in the public domain, SCRAM suspects it will find its own way to the inquiry.

DoEn Shuffle

The Department of Energy have finally divorced renewable energy sources from nuclear power, at least in terms of ministerial responsibility.

Cecil Parkinson has added a new member to his line-up. The new team, and their responsibilities, are as follows:

- **Baroness Hooper** will be the new Under Secretary with responsibility for renewable energy and energy efficiency;
- **Peter Morrison MP** will oversee oil, gas and the offshore supply industry;
- **Michael Spicer MP** will now concentrate on nuclear power, coal and electricity.

Baroness Hooper, a member of the unelected upper house, will also "have responsibility for handling of all Departmental business in the House of Lords."

US Refuse Refused

Controversial plans to import 2 million tonnes of US domestic refuse to Cornwall, for dumping in landfill, have been abandoned (SCRAM 66).

According to George Pritchard, the architect of the proposal, the scheme has been dropped as a result of massive public opposition: "Power Waste and Water [the company involved] said they would never pursue the proposal without the backing of the local people."

The proposal has, however, thrown light on the inadequacy of waste disposal legislation in this country. The Commons environment committee were told by officials from Cheshire and Derbyshire county councils that they had difficulty in prosecuting waste contractors because of loopholes in the law, and that the Department of the Environment and HM Inspectorate of Pollution had too few staff.

It is the poor legislation in this country, and resultant inexpense of waste disposal, that draws importers of waste to our shores. Graham Gordon of Cheshire County Council called for a national policy on importing domestic waste. He is particularly concerned about diseased plants and animals which could be brought in with such waste. Colin Moynihan, the junior environment minister, informed the council officers that it would take time for him to make orders banning the imports.

According to Pritchard, several councils have now contacted PWW, to ask "why can't we do it with our wastes."

PWW are holding negotiations with Devon County Council into the prospect of using Devon's waste to generate electricity. A formal proposal has been lodged with council officers.

The proposal involves taking domestic wastes and sewage sludge, which is currently dumped at sea, and putting them in a digestive system so the methane generated by decomposition can be tapped, and used as a fuel. The remaining waste will then be dried and burnt in an 18MW power station which will be fitted with special scrubbing devices to remove the dangerous gases coming from the industrial waste in the sewage sludge.

If, as seems likely, tougher waste disposal laws are brought into force, projects like this one will become much more economically attractive.

Solar Developments

'Daylight energy' will provide the heating needs of 94 purpose built student flats at the University of Strathclyde.

The flats, designed by German-based company, Kaiser Bautechnik, have south-facing, walls incorporating specially developed insulation material which stores the heat of the sun and releases it at a constant rate. Computer operated blinds open and close to regulate room temperatures.

Kaiser believe the scheme will reduce heating bills by over 90%, saving £70,000 anually.

Scotland was chosen to test the design in the dank Caledonian climate. The University's Energy Studies Unit will monitor the buildings performance.

"This technique could displace the need for some of the more nasty fossil fuels, and nuclear power," said Richard Nawrot, Kaiser's managing director.

The scheme's costs are being met by Kaiser (£4m), the EEC (£1m) and the SDA (£1m). Richard Morris of the SDA said: "We are quite excited about this because if it is successful, it will lead to a demand and we would like to see Scottish companies supplying the company with components. There is also substantial export interest related to this."

- A solar cell has breached the magical 30% light to electricity conversion efficiency.

Scientists at Sandia National Laboratories have designed a multi-layer cell with greater than 31% efficency. It has been achieved by combining their research with that of the Varian Institute - who have a 27% efficient cell - and Stanford University - whose design generates electricity from 3.8% of sunlight, focused onto the lenses by mirrors. The Varian design forms the top layer, with the Salford cell on the bottom.

The Industrial Committee, set up by the US Department of Energy to examine the commercial future of active solar power, reported that cells would have to be over 30% efficient before they could be used by utilities to generate economic power.

REVIEWS

Magnox: The Reckoning by Philip Davies. Friends of the Earth, 1988. 112pp, £5 (inc p+p).

With the closure of Berkeley, expensive modifications ordered for Bradwell, and further Long Term Safety Reviews in the pipeline, this latest book from Friends of the Earth is both timely and incisive.

From its very inception the Magnox programme was uneconomic. Sir Christopher Hinton, the first Chair of the CEGB, fought a long and only partially successful battle against the government to scale down the programme for that very reason. Construction and cost overruns, and their poor performance, have made them even more expensive than expected. All this sounds very familiar, but most anti-nuclear campaigners have tended to concentrate on the more well known disaster - the AGRs.

By calculating load factors using the design rating (as opposed to the derated value), and the scheduled completion date (as opposed to the actual completion date), Philip Davies paints a history of a disaster in the making. Instead of delivering 75-80% of their maximum design output, the Magnox reactors collectively managed only 52%.

Hinton estimated in 1962 that the additional cost of generating electricity by nuclear rather than conventional means was a staggering £20 million per year. Even then, his figures understated research and development and capital costs; nuclear wasn't expected to make such a high rate of return as coal, and the price was reduced by a credit given for plutonium.

It's only since 1980/81 that the CEGB have used the more accurate 'current cost accounting' methods, but they still have various ways of disguising the true cost of nuclear power. They are now prepared to admit that the Magnox stations have been more expensive than coal, but claim they'll still work out slightly cheaper over their 30 year life. To achieve this outcome their calculations have to ignore things like the Long Term Safety Reviews and the effect of privatisation, as well as using an unrealistically high price for future coal prices.

Nor does the book lead one to be complacent about safety; the worst accidents are catalogued, including a partial meltdown at Chapelcross in 1967. They have no secondary containment to protect against a major release of radioactivity into the environment. Even during normal operation they release a considerable quantity of radioactivity. Evidence also suggests that plutonium from civil Magnox stations has been used in nuclear weapons.

The legacy of nuclear waste left by the dying Magnox programme is considerable. Nearly all the accidents and discharges from Sellafield can be blamed on this uneconomic programme. With the materials recycled by reprocessing unlikely ever to justify the cost, the whole Sellafield project can be seen as nothing more than expensive environmental destruction.

We can only judge the success of the technology by the Magnox programme - the evidence is that the 'inspiring dream' of nuclear power has turned into a nightmare.

All in all this is an incredibly useful text, with 155 references and 12 handy appendices, but an index might have made the information more accessible.

Unfortunately Davies has dealt mostly with the CEGB's Magnox reactors. For completeness, you'll need SCRAM's briefing on Hunterston A & B which costs £3.50.

PETE ROCHE

Nuclear Power and the Trade Union and Labour Movement: erosion of opposition? by Dave Elliot. The OU Technology Policy Group, 1988. 30pp, £2.

A fierce debate has been raging in the Labour and Trade Union movement: do we or don't we support nuclear power?

Over the years the Labour Party has made various statements on nuclear power, ranging from Neil Kinnock's "the next Labour Government will not sanction the ordering of another nuclear plant." (New Society, 1986) To the sublime environmentalist, Jack Cunningham, "nuclear power will exist in Britain well into the 21st century. I do not see it coming to an end in the short time scale some people have suggested. This is certainly not the intention of a Labour Government pledged to create a million jobs in two years." (BNFL News 1987) Adding, he would not "expect a Labour Government to order a nuclear power station in its first parliament."

Cunningham, Labour's environment spokesman whose constituency includes Sellafield, believes it is going to be "active" for a long time.

The trade union movement also has its pro- and anti- lobbies. The problem is not a simple one. A union's fundamental role is to protect the jobs and conditions of its members. The TUC for their part have to formulate policy based upon the wishes of its member unions. Whilst unions like EEPTU, now expelled from the TUC, have members in the nuclear industry and are vehemently pro-nuclear, the NUM are obviously opposed.

The TGWU, one of the country's most powerful unions, under General Secretary Ron Todd retained strong opposition until the 1987 TUC Conference when Todd was forced to dilute their stance: "Any proposal to close nuclear power installations that does not include plans for alternative employment for the workers affected will be fought to the very end by the TGWU." This however is not insurmountable: any plan to phase out nuclear power would inevitably have to face the question of redeploying the work force.

With the closure of the FBR programme at Dounreay the issue of employment looks set to dominate the debate.

Whilst broadly speaking, both the Labour Party and the Trade Unions are opposed to nuclear power their opposition is weak and could be subject to change. The anti-nuclear movement must prevent this happening.

Dave Elliot takes the debate through all its complexities; using carefully selected quotes he relates this political hot potato with clarity and professionalism. A must for anyone involved in the nuclear debate.

MIKE TOWNSLEY

Welcome to my temporary home which I'm occupying during SCRAM's accounts rebuilding work. I apologise for any inconvenience caused by this change of venue - but it's nothing like the inconvenience my good friends at SCRAM are currently facing.

£ £ £ £ £ £ £ £

How confident are you of BNF's ability to transport tonnes of plutonium halfway round the world? This little anecdote may increase your apprehension.

Mr William McGlaughlan, BNF's transport director, arrived at Kyle & Carrick District Council for a meeting to discuss plans to fly plutonium from Prestwick to Japan. It was early morning, and he had had a long drive, but as he parked he bumped into a Councillor's car.

He disembarked and introduced himself: "I'm William McLaughlan, BNF's transport director. I'm afraid I've just scratched your car." He saw the funny side and assured the Councillor that BNF will be more careful with the plutonium!

£ £ £ £ £ £ £ £

An employee at Torness had a nasty fright only four days after he started work.

After completing a job in a controlled area he left via two security doors. Unfortunately the second door didn't recognise his personal card: he was stuck in technological limbo.

Just then an alarm sounded and a message came over the tannoy: "There has been an incident in number one reactor. All personnel please evacuate the building." The worker became concerned.

Fortunately, the 'incident' was only an exercise, but the worker hadn't been told.

£ £ £ £ £ £ £ £

An SSEB press officer resigned from his post in September, apparently with nowhere to go. It is thought his departure had something to do with the delay in publishing the Board's 1987/88 Annual Accounts.

However, LBR understands that he also left a similar job with the Trustee Savings Bank two years ago, just prior to their controversial privatisation. Could the SSEB's imminent selling-off have prompted his resignation?

£ £ £ £ £ £ £ £

As regular SCRAM readers will know, the UK's response to Chernobyl was distinctly lacking, but other countries were also ill prepared. The IAEA have therefore set up a round-the-clock emergency and advice centre at their Vienna HQ to make sure problems don't occur next time.

But there appear to be teething troubles. Brazilian authorities were the first callers, after the 1987 incident when caesium was released from a stolen radiotherapy machine. Unfortunately the centre wasn't fully operational and no one on duty could understand Portugese.

The IAEA now ask for all emergency messages to be sent in English. LBR thinks it's a bit much: they support the export of nuclear technology to countries in the 'Third World' but don't have staff who can understand their languages. A prime example of nuclear imperialism.

£ £ £ £ £ £ £ £

Toshiba-EMI, gave no reason for suspending the scheduled release of a single and album by a Japanese rock group **RC Succession**. The album "Covers", which includes the single, "Love Me Tender", was to be released on 6 August - Hiroshima Day.

What have Toshiba-EMI got against early '60s rock music, you may ask? Well, it's not the music as much as the lyrics - they've been written by the group's vocalist, and are anti-nuclear. The recording company's parent company is the Toshiba Corporation who build nuclear power stations!

'SAVE SCRAM' APPEAL FORMS

Yes, I would like to help save SCRAM.

I enclose a donation of:

£10 ☐ **£50** ☐ **£100** ☐

Name .....
Address .....
.....
Postcode ..... **Tel** .....

I would like to give a subscription to a friend as a xmas present. Please send a year's issues of SCRAM to:

Name .....
Address .....
.....
Postcode ..... **Tel** .....

I enclose £10 ☐

I would like to help pay SCRAM's wage bill with a regular monthly donation of:

£1 ☐ **£5** ☐ **£10** ☐ .....

Please send this form to my bank.

To the Manager:

..... **Bank**
Address .....
.....
Postcode .....

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 number 2 account 258597 and make similar payments monthly until further notice.**

Signed ..... **Date** .....

My friends at SCRAM tell me they are in a financial stew. That's why I have donated my page to their appeal. How much will you give? Turn back a page for the appeal donations form (my column is there too!)

WHY IS WALTER LOOKING SO SMUG?

BECAUSE SCRAM IS FACING A FINANCIAL CRISIS OF TINY PROPORTIONS

To many people £6,000 is a ridiculously small amount of money to go bust over.
In fact Walter Marshall is probably laughing as he reads this.
But a deficit of just that amount threatens to close SCRAM down. FOR GOOD.

If it happens, it won't mean we've lost the argument, but we will lose this Journal.
Campaigners against nuclear power and in favour of safe energy will lose access to the invaluable information in the SCRAM archives. And SCRAM's three workers will be out of a job.

The reason is that after 13 years of campaigning, we've become victims of our own success.
The more people who turn to us for information they can't get elsewhere,
the bigger our bills for printing, stationery and phone calls.

We hope that everyone who is able will send us part of their next pay cheque.
£20, £50 or even £100 may seem a lot now, but it's a tiny price to pay for a safer future.

Send in your contribution today and help wipe the smile of Walter's face.