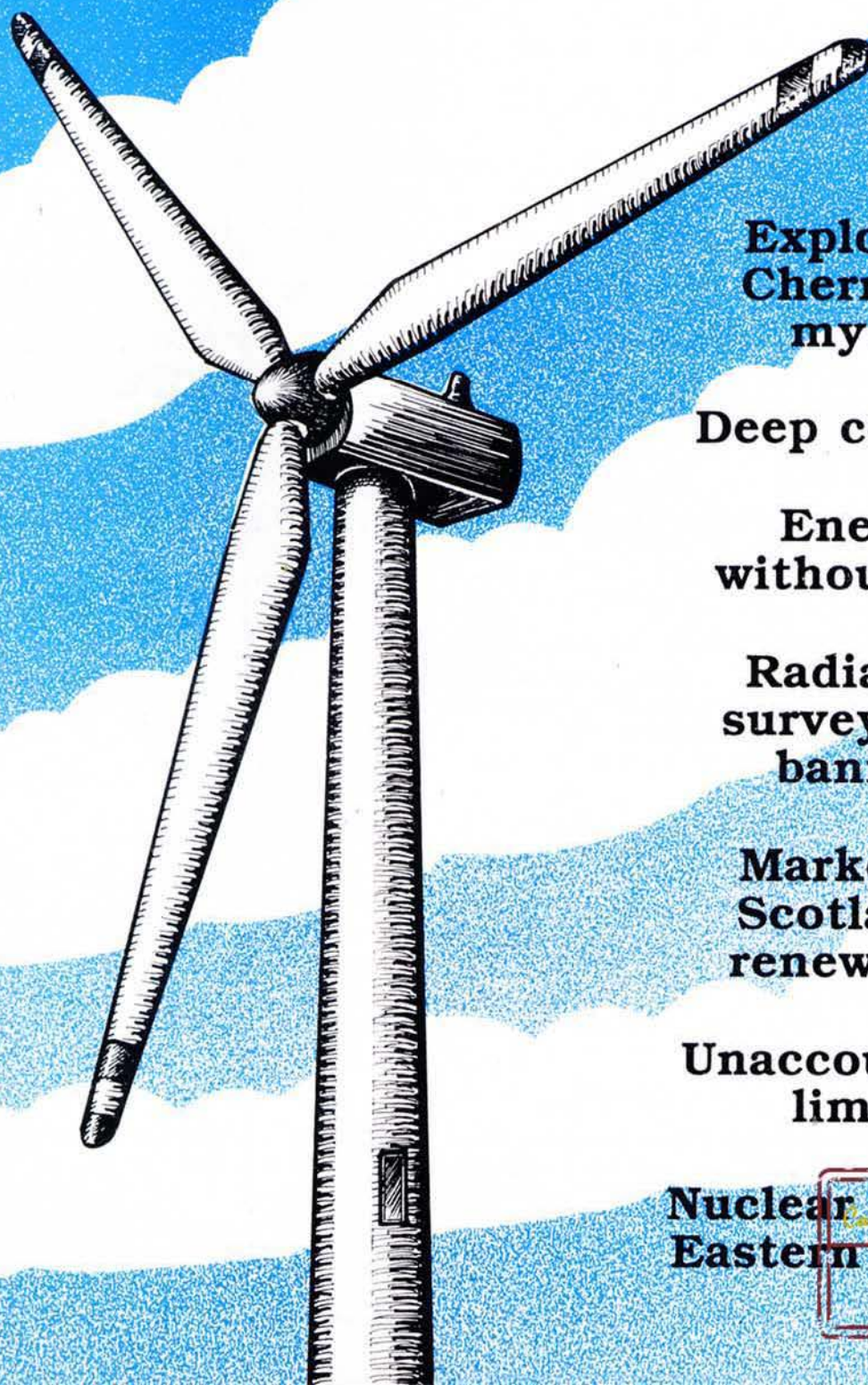


SAFE ENERGY

No.84

August/September 1991

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**Exploding
Chernobyl
myths**

Deep concern

**Energy
without end**

**Radiation
survey ship
banned**

**Marketing
Scotland's
renewables**

**Unaccountable
limits**

**Nuclear lure for
Eastern Europe**

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COMMENT

IT is almost impossible to write an article about any part of the nuclear industry without mentioning the Government's planned review in 1994.

Economics, like never before, have taken hold of the industry, and all of its activity is geared towards bringing costs down in time for the fateful day – some 40 years after being brought to life – that they will be called upon to justify their existence.

Magnox reactors, a liability during privatisation, forcing the retention of the nuclear industry in the public sector, offer the cheapest power in the UK, claim Nuclear Electric (NE). Running them well into the next century, 10 to 15 years beyond their design life, will see them generating at 'marginal' costs of less than 1.5p a unit.

And, if that's not ridiculous enough, NE now want to shunt decommissioning firmly into the laps of their great great grand children, saving £50 million a year on set aside costs. They are also harbouring the hope that they can avoid setting money aside for removal of the reactors preferring 'entombment' instead. For *entombment* in the nuclear lexicon read *abandon*, as with *repository* and *dump*.

Reprocessing, by which British Nuclear Fuels steal one third of the generators budget, will also be sacrificed on the 1994 altar. Scottish Nuclear have become environmentalists – well economists – and are planning to store spent fuel on-site in dry stores. If given the go-ahead, NE will not be far behind.

Economic manipulation aside, operational safety and efficiency will not be so easy to amend. Trawsfynydd, a Magnox, which has been shut down since February with no restart date in sight, may be economic when it is running, but getting it to do so is about as difficult as spelling its name. Torness was touted as one of the new economic AGRs because it can be refuelled on-line. It can't.

And what are they going to do about Nirex, and the intractable problem of waste management. Nuclear waste has no solution, the proposals from Nirex will simply not do. No matter how much they rush to prepare a policy for the review, there is no way the people of Cumbria or anywhere else in Europe are going to buy the deep dump. Their plans contain more holes than Superphenix.

Economic 'slight of hand' is not enough, parlour tricks cannot dispel the environmental nightmare that is the nuclear industry.

JOHAN Major's first big green speech was a charade. The G7 member who could give prominence to energy – if somewhat minimalistically – chose the domestic forum to totally ignore it.

Here was an opportunity for positive initiatives in the key areas of renewables, energy efficiency and transport. So what did we get? A trick of the free market – a partnership between modern business and green consumers. Major's sincerity was carried on emotional references to destruction of rain forests, species loss and desertification.

What of the partnership? It is being given every opportunity to prove itself as the Government evades action, or worse, impedes developments in the key areas above. Numerous reviews and inquiries from both 'Houses' bare witness to this. Industry for its part, in the form of National Power (NP), is dismantling the UK's main acid research centre. All non-commercial research inherited from the CEBG, despite privatisation assurances to the contrary, is to be abandoned.

Actions speak louder than words: it is not difficult to see economics and electioneering getting in the way of real commitment to the environment. The partnership will remain fragile as long as the Government shows contempt instead of commitment.

With this issue, the **SCRAM Safe Energy Journal** celebrates 14 years of continuous bi-monthly publication. Regular readers will notice the change of masthead, by no means the first. We feel that the **Safe Energy** title better encapsulates the journal's contents, and will hopefully attract new readers. **SCRAM** will continue to supply both nuclear and alternative energy news and features, as it has over the years.

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

SCRAM, s **Safe Energy** journal is produced bi-monthly for the British Anti-nuclear and Safe Energy movements by the **Scottish Campaign to Resist the Atomic Menace**. Views expressed in articles appearing in this journal are not necessarily those of **SCRAM**.

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SAFE ENERGY

FEATURES

8 Exploding Chernobyl myths

Following much recent debate on the health effects of Chernobyl, **Dr Don Arnott**, a former IAEA consultant, takes a closer look at the explosion itself. He questions the nuclear industry's 'it couldn't happen here' approach, and considers the possible consequences of a similar accident in a Western design reactor.

10 Deep concern

Sellafield has been chosen as the site for the UK's low and intermediate level waste dump despite serious misgivings about the scientific justification of the choice. **Mike Townsley** reviews Nirex's reasoning, and finds political expediency riding roughshod over science.

12 Energy without end

Promotion of renewable energy is vital and urgent. Friends of the Earth's renewable energy campaigner, **Michael Harper**, outlines their newly launched campaign to make the future renewable.

14 Radiation survey ship banned

The Government's banning of a Soviet research ship has scuppered a plan by Scottish Nuclear Free Zones for radiation monitoring of coastal waters. **Steve Martin**, the project's coordinator, corrects some of the inaccurate statements surrounding the ban.

16 Marketing Scotland's renewables

Despite the massive resource in Scotland, privatisation of the electricity supply industry has done little to encourage the development of renewable energy. **Steve Imrie**, of the University of Strathclyde's Department of Economics, proposes changes the post-privatisation set-up.

18 Unaccountable limits

Dr Patrick Green, radiation campaigner for Friends of the Earth, looks at the way radiation dose rates are set. The relationship between different radiological protection agencies, and the role of EURATOM as promoter of nuclear power and setter of safeguards, cast doubt on the validity of their conclusions.

20 Nuclear lure for Eastern Europe

Largely deprived of a home market, the Western nuclear industry is touting its wares in eastern Europe. **Mary Beth Christie**, **Nada Kronjatanic** and **Zsusa Foltanyi** look at the choices faced in Czechoslovakia, Yugoslavia and Hungary.

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Down in the dumps

SELLAFIELD has won the nuclear industry's lottery to play host to the nations low- and intermediate-level nuclear waste, despite fierce competition from Dounreay which, according to Nirex, only lost out because it would have led to an extra £1.25 billion transport costs.

"Intensive investigations over the last 2 years, at a cost of over £50 million," say Nirex, "indicate that the geologies at either Sellafield in Cumbria or Dounreay in Caithness could be suitable for the safe disposal of radioactive waste deep underground." However, "Sellafield is the preferred site because approximately 60% of the waste arises from British Nuclear Fuels' operation there.

The timing of the decision and its scientific credibility has been attacked by the British Geological Survey (BGS), who, acting as consultants for Nirex, were involved in the site selection process.

Adrian Bath of BGS said: "We were concerned that the decision was premature, when one looks at it from a technical point of view." He argues that it is not yet possible, on the basis of two boreholes at each site, to distinguish which of the 2 sites is better from a geological point of view. "At the end of a drilling programme when you have some ten boreholes, then you can make a distinction." This further fuels the belief that the decision is based on 'political expediency' and not geology (see p10).

Surprise timing

At the press conference held in Inverness - simultaneous conferences were held in London and Cumbria - Dounreay director, Gerry Jordan, admitted that the strength of opposition in Caithness and throughout Scotland was a factor in the decision. He also admitted to being surprised by the timing of the announcement, while test drilling was still being carried out at Dounreay and expressed the personal belief that this indeed had been a political judgment.

Liz Morgan Lewis, Nirex's head of public affairs, with a pained expression, was quick to point out that the announcement had been made for "technical and geological reasons and not political ones." However, Nirex conceded that they would not be withdrawing from Dounreay immediately.

They intend to carry on drilling until the programme is complete at the end of September.

"Dounreay's door is not left ajar - it is closed and Nirex have to knock on it for us to decide whether to open it again," said Jordan. A Nirex geologist, confirming this position, denied that Dounreay was 'first reserve' if future investigations at Sellafield prove the site to be unsuitable. In such an event, he claimed, they would return to basics. This would mean Dounreay would be put back in the 'hat' along with the rest of the UK, thus discarding as irrelevant the investigation of the Dounreay area, costing some £15 million, and all the preliminary work conducted up to that point. He also declined to name the ten sites which have been held in reserve since the announcement of Sellafield and Dounreay as the front runners in March 1989.

Dounreay doubt

Statements over the future potential of Dounreay as the dump site made in Inverness came in stark contrast to those made in London by Nirex managing director, Tom McInerney, who said the company was keeping the option of Dounreay as insurance against geological surprises at Sellafield. Indeed, prior to the announcement he told the Aberdeen Press and Journal that he was adamant that a second site would be "held in reserve". When pressed on whether any ministerial pressure was being brought to bear to rule Dounreay out entirely, he dodged the question answering: "The politicians may take one view, we may take another. We will keep our options open until we are finally satisfied on technical grounds that we have chosen the correct site."

No pleasure

Highland Regional Council, which had set up a £50,000 fighting fund to oppose Nirex, welcomed the decision. However, Duncan McPherson, the Region's Convener, said it gave him "no pleasure" that Sellafield had been chosen, nuclear waste should be stored above ground at the place of origin and not buried. He warned: "We will never drop our guard on this issue and we will be ready to re-activate our high profile campaign if a threat to Dounreay re-emerges." No decision has yet been taken by the Council on whether to lodge an objection to the dump at Sellafield.

According to McInerney planning permission for the £2.5 to £3.5 billion dump will be applied for in October 1992. They hope to begin work in 1995, if given the go-ahead at a public inquiry which is expected to start in late 1993. But, he admitted that the long term safety assessment of the repository would not be available. "The final safety case will not be made until the repository is constructed."

High dudgeon

Both McInerney and Jordan stressed that they had no responsibility for high-level waste. McInerney pointed out that Government policy dictates that it must be stored for at least 50 years before disposal. After 50 years the high-level waste will have lost enough of its heat generating capability to qualify as intermediate-level waste under current industry classification criteria. While Jordan, prior to any prompting from the assembled media, decried as "mischievous and totally fallacious" any suggestion that Dounreay would now be earmarked for disposal of high-level waste.

Reactions, in both Cumbria and Dounreay, to the choice of Sellafield, should shatter any illusions Nirex is harbouring of an easy ride at Sellafield. Scotland Against Nuclear Dumping (SAND), in a statement which must have come as a surprise to the company, said it was "disappointed" by the decision. SAND is more concerned about what Nirex is doing than where it intends doing it. Adding, that Cumbrians, like Highlanders, would reject "unsafe and irresponsible dumping proposals".

Growing opposition

While being slow to start, opposition is now mounting in Cumbria. In Gosforth, which the villagers say will be within 300m of the dump, the Parish Council have set up an Action Group. The chair of the Group, Lieutenant Colonel Norman Murphy, believes that about 80% of the villagers are opposed to Nirex. Until recently Gosforth was a nuclear town, 300 of the residents - one quarter of the population - work at Sellafield, some 2 miles away, and a further 300 are retired British Nuclear Fuels employees.

Martin Forwood, campaign coordinator of Cumbrians Opposed to a Radioactive Environment (CORE), said: "The opposition has surpassed our wildest imaginings." □

What future Dounreay?

AEA Technology, the operators of Dounreay, looking forward to life after Nirex, are "busy" devising ways to preserve as much of the stations work force as possible.

At the Inverness press conference to announce Sellafield as Nirex's preferred site for a waste dump, Dounreay chair, Jerry Jordan, said he was confident that they can secure a significant number of long term jobs at the site. "Our diversification will retain something like 1,200 jobs and a repository [as well] would have retained 1,550." Dounreay will continue to contribute £30 million annually to the regional economy, he claimed.

Jordan is obviously keen to put the Nirex experience, and the resulting bad feeling in the local community, behind him, so they can get on with their "own renaissance", rather than spending "time fighting a rearguard action on behalf of Nirex."

This regeneration, or renaissance, will be based on specialist fuel reprocessing and fuel fabrication, decommissioning, north sea oil related activity and research into renewable energy sources.

Renewables

Although the Authority say they are sincere in their investigations of renewables, they "will never be of sufficient scale to underpin a significant number of jobs at the site." Jordan estimates that they will produce about 30 to 40 jobs.

One of the main areas being pursued is reprocessing Highly Enriched Uranium (HEU) spent fuel from research reactors (*SCRAM 79*). So far this year contracts worth £7.8 million have been signed, according to Jordan. They are paper contracts only. No transports of spent HEU fuel have succeeded in making it into the UK, never mind up to Dounreay (*SCRAM 81*).

Recently, fierce protests from passengers, who were shocked to find large containers marked with radiation signs waiting for them as they drove onto the Norwegian ferry Venus, have forced the owners to ban any future transports. Jon Erik Nygaard, managing director of the Colorline, owners of the roll-on roll-off ferry, told *SCRAM* that following a board meeting the company had decided to stop carrying nuclear materials on passenger ferries, not because the company "thought the risks were too great, but because of public concern."

The 72 spent AGR fuel rods were being taken across the north sea from Newcastle to Bergen. Destined for the research reactor in Halden, in south-west Norway, they had come from the Winfrith research centre.

Ferry fires

Further strengthening the position of environment groups, the UK Labour Party launched a policy document on ferries called *Safe Crossing* in July. It contains a commitment to ban irradiated fuel on roll-on roll-off ferries. Labour are concerned that the transport flasks would not stand up to a real life fire. While the flasks are tested to 800°C for 30 minutes, figures from the International Maritime Organisation reveal that the average duration of major fires is 28 hours at sea and 23 hours in port, with temperatures soaring to 1,100°C.

Meanwhile, in May, the US Department of Energy (DoE) recommended the resumption of "receipt and reprocessing of spent research reactor fuel." The move follows the publication of an Environmental Assessment which proposed a "Finding of No Significant Impact" (FONSI). Dounreay, who have been bidding for the contracts blocked in the US since the beginning of 1989, welcomed the FONSI saying: "It underlines what we have always stated - that the transport

of research reactor fuel is safe."

Initially the consultation period on the FONSI was meant to be just 30 days, however, after receiving a considerable number of objections the DoE agreed to Greenpeace's request that the consultation period be extended by another month.

If objectors fail in their demand for a full environmental impact assessment, then the FONSI will take effect. This would lead to the implementation of a policy "for 10 years or 481 shipments, whichever comes first, of receiving, reprocessing and making financial settlement for US origin spent research reactor fuels." Unlike AEA Technology, the US do not intend to return the resultant waste. Indeed, one of their main political justifications for the restart is that "the acceptance of US origin fuel serves nonproliferation interests by removing material potentially usable for nuclear weapons from domestic and foreign reactors."

Free gift

The Authority are also "quietly confident" that they can prolong the life of the Prototype Fast Reactor beyond the 1994 deadline and break the current stalemate with the Government.

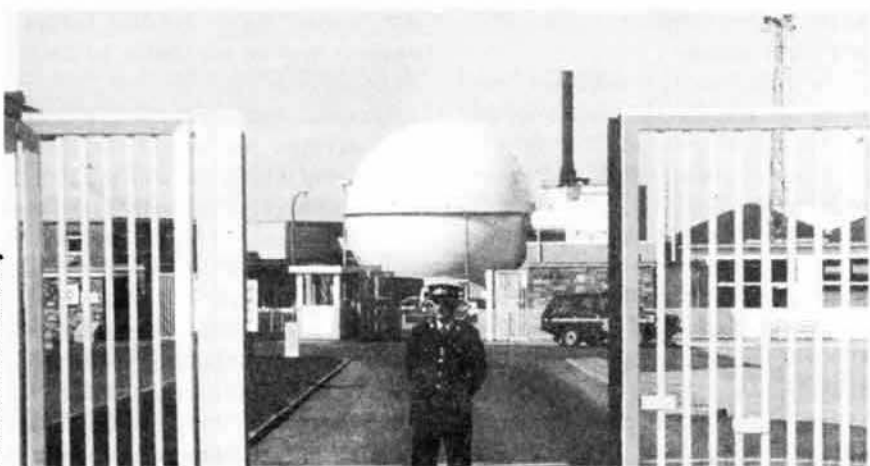
"A key element in the jigsaw" is the acquisition - free of charge - of the fuel rods designed for Germany's ill fated SNR-300 fast reactor at Kalkar. 205 fuel rods containing plutonium were fabricated especially for the SNR-300, however, they would require modification to be used at Dounreay. Jordan believes an agreement is "so close ... that one can say we are on the eve of it."

The Kalkar fuel would keep the PFR running for a further four years, but because the modification would take 2 years Jordan is understandably apprehensive about the timing of any deal. His apprehension is apparently not shared in Germany; replying to a recent parliamentary question the Federal Government said: "Various possibilities for future use are being examined. The examinations have not yet reached the stage where detailed statements on possible proceeds or costs may be done."

If the PFR can be kept open until 1994 it will allow sufficient time to substantively demonstrate fuel for a European Fast Reactor. Dounreay is the only place such work can be carried out in Europe. "The Germans and French and our European partners have a vested interest in Dounreay," argues Jordan.

Whether Jordan or anyone at Dounreay actually believes the plant has a secure future is open to doubt. Perhaps they think that if they say it often enough it will come true. □

Photo: Mike Townsley



Dounreay: open for business

Just deserts

SCOTTISH NUCLEAR (SN) is planning to build dry stores for its spent nuclear fuel at both of its AGRs - Torness and Hunterston B - in a move that it hopes will take it into the realms of profitability.

Plans for a modular design, which can be extended to meet demand, have been lodged with the Scottish Office, announced SN's chairman, James Hann, at the Wealth of Nations conference held in Edinburgh in June.

An example of the store, a modular vault dry store (MVDS), designed by GEC Alsthom Engineering systems, is currently under construction at the Fort St Vrain nuclear station in the US. With a life span of 50 years SN estimate that it would cost £50 million and could house about 1,000 tonnes of spent fuel for 50-75 years. Not only would the store save money, it "is probably safer", Hann told the *Independent* last year.

The Government have been handed a poisoned chalice, SN's plans bring two of its policies into sharp conflict. On the one hand they are pro-reprocessing and desperate to show that the £2 billion - according to the nuclear industry - Thermal Oxide Reprocessing Plant at Sellafield is not an economic White Elephant and on the other they must show in the 1994 review that the industry is economic.

It is not the actual volume of spent fuel being withdrawn that will cause the difficulty but the questions that will be posed by disgruntled English and Welsh consumers who are paying through the nose, or rather the Non Fossil Fuel Levy, for the industry's extravagancies.

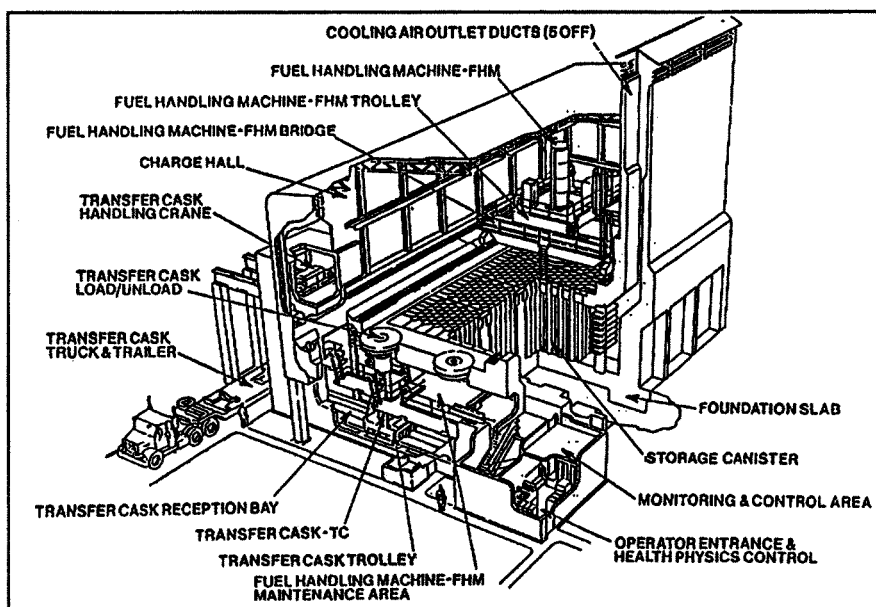
Hann argues that SN's withdrawal will not effect the first 10 years of operation of the plant, during which its operators British Nuclear Fuels say they will receive £6 billion from contracts already agreed. However, it is not beyond the bounds of possibility that both SN and Nuclear Electric, who between them represent one third of existing contracts, will simply refuse to honour deals which were signed by their predecessors - the SSEB and CEGB - says the influential Financial Times magazine *Power in Europe (PiE)*. *PiE* believe that this would leave BNFL in a difficult position over whether or not to take the companies to court. "The resulting case would almost certainly bring to light long-concealed details of the THORP contracts."

Indeed, such a theory is supported by SN's failure to send any spent fuel to Sellafield from Torness. It would appear

to be taking an unusually long time to get the necessary Nuclear Installation Inspectorate licensing for the fuel handling processes along the route travelled by the spent fuel within the plant (*SCRAM 83*).

The stores would take between 12 and 18 months to build. Ideally, SN would like to commission them by 1994, when existing contracts with BNFL run out, however they admit that this is a very tight timetable and would require the plans to be approved without a public inquiry.

It is unlikely that such permission would be forthcoming, Scottish Office Minister, Lord James Douglas Hamilton, agrees with the local Labour MP, John Hume Robertson, that the public would need to be assured of the safety of on-site storage. "A public inquiry may indeed be the best way of establishing this", he concluded. □



Modular Vault Dry Store (MVDS)

Decommissioning

FULL decommissioning of Magnox nuclear power stations would not begin until 135 years after the off switch is thrown if the Government approves plans submitted by Nuclear Electric (NE), thus putting the onus of what to do with redundant nuclear power stations firmly on the shoulders of future generations.

Such a plan would slash the company's decommissioning set aside provision by around £50 million a year. It would also involve the construction of "safe stores" around the decrepit plant.

Originally the industry planned to have all the spent fuel removed from the reactors after five years. It would then

have proceeded to dismantle three quarters of the station, including all non-radioactive plant, leaving the reactors to be sealed off for up to 100 years while levels of radioactivity diminished. The site would then be returned to so-called 'greenfield' status.

Now, however, they envisage leaving the reactors for 130 years after the fuel has been removed. The stations would then be maintained and monitored for 30 years. At the 30 year mark all radioactive parts of the station would be encased in concrete and cladding 'safestores'. The non active parts of the plant, they add optimistically, could be used to generate electricity conventionally. This involves the fairly large assumption that such equipment would not be totally obsolete after the 35 year period.

What would happen next is a matter of considerable speculation. While the company claim their calculations are based on the premise that everything will be cleared away, they are not beyond suggesting that in some cases it may be preferable to simply "mound over" the station. Such an option will result in considerable further savings, and avoid the thorny problem of what to do with the 10,835 tonnes of highly radioactive steel and the 1,010 tonnes of highly radioactive concrete that dismantling would otherwise produce.

Fred Passant, NE's Waste and Decommissioning Manager, who made the announcement during a British Nuclear Forum conference at the end of June, said any decision on mounding "is for future generations." □

Trawsfynydd caesium

RADIATION levels in the lake next to Trawsfynydd nuclear power station are dangerously high according to an unpublished 1988 Central Electricity Generating Board report.

The lake, which is the only inland site of a UK nuclear power station, contains levels of caesium which are ten times higher than around any other Magnox station and levels of plutonium at least three times as high.

The report shows that the Ministry of Agriculture's monitoring programme has seriously underestimated the effect of the station's radioactive effluent. Seeking to establish the feasibility of constructing a PWR at the site, it found that it would be necessary to enlarge the lake, which would involve its draining,

but that this would allow dangerous amounts of dust containing caesium and plutonium to blow out. Plans for a PWR were abandoned and the report buried.

Her Majesty's Inspectorate of Pollution's latest estimates for dose levels for local people who eat fish from the lake gives the potential doses, on current discharges, above the 0.5mSv maximum recommended by the Government.

■ The station has been shut down since February because of embrittlement problems in the steel reactor vessel. Trawsfynydd normally supplies the grid with about £100,000 worth of electricity daily. "It is costing us money for every day it's out. That's not a situation we are happy with," said Nuclear Electric (NE), who have asked the Nuclear Installations Inspectorate (NII) for per-

mission to restart the reactor. The NII are studying NE's safety proposals but "cannot say when permission will be given." □



Trawsfynydd nuclear power station

Sizewell unwell

FRENCH computer software that would have controlled the day to day operation of the Sizewell B nuclear power station has been abandoned by Nuclear Electric (NE), a move that not only confirms safety fears expressed about the system at the Hinkley C inquiry but threatens to delay completion of the plant.

The software has come under heavy fire from all corners including the British Computer Society and the Institute of Electrical Engineers (IEE). Last year the IEE said: "It is not presently possible to quantify the reliability of the software."

Industry journal *Nucleonics Week* reported that "a long standing error in computer software" caused a fuelling accident in Canada. The error "only came to light under a specific set of circumstances".

The station will now be fitted with a system made by Westinghouse. Deal-

ing with Westinghouse is not without problems of its own. They already have a contract to supply a prototype reactor protection system for Sizewell which is designed to automatically shut down the reactor in an emergency. So far the Nuclear Installations Inspectorate have refused to licence the system. They want independent confirmation that it can do what the manufacturers say.

Switching to the Westinghouse system will also require last minute changes to the reactors control room, finding space for more hardware, and modifying the heating and ventilation system.

Brian George, the project director at Sizewell B, claims that there is enough slack in the budget to allow for the change. He insists that the project will be brought in on time: "Sizewell B is still eight months ahead of schedule and we are confident that Westinghouse, who are already heavily involved in the project, will keep it on course." □

Caesium in Western Isles

DISCHARGES from the Sellafield reprocessing plant in west Cumbria are resulting in caesium-137 levels in the people of the Western Isles of 5 times those found in the rest of the Scottish population, according to a study published in the *British Medical Journal* (BMJ).

While the levels do not breach Government regulations, the report said "it is important to record that radiation discharged into the sea could return to land a considerable distance away from the site of discharge and enter the human food chain."

It also points out that: "The prevailing winds blow seaspray several kilometres inland. Thus most of the island's inhabitants, livestock, and grasslands are exposed to the sea."

Many people are taking this study as evidence of a proven pathway between Sellafield and the west coast of Scotland. Ultimately it may lead to a large number of Scottish local authorities objecting to proposals for a nuclear waste dump at Sellafield. □

Flights of fancy

FROM 1992, packages of plutonium, totalling some 11 tonnes, will be transported around the world from Sellafield and its French counterpart La Hague, under inadequate 1960s road and rail standards warns a report by the Nuclear Free Zones (NFZs)*.

In evidence submitted to the European Parliament review of international transport of nuclear materials, the NFZs reveal that while the International

Atomic Energy Agency (IAEA) concluded a review of safety standards by December 1990, the new regulations will not be issued until 1995. It could then take a further five years to incorporate the regulations into national legislation.

Documents leaked to the NFZs show that the Agency has warned the Government that plutonium which is being flown out is packaged in inadequate containers - usually made of wood clad in steel. The Agency say the containers should be banned until more stringent

test can be conducted.

However, the criteria proposed by the IAEA, including impact tests of 85m/s - 82.6m/s faster than is currently necessary in the UK - fall far short of US regulations, where containers have to withstand impacts of 129m/s. □

* The International Transport of Plutonium, Spent Nuclear Fuel and High Level Radioactive Waste: An assessment of safety, Security and Proliferation Issues. Nuclear Policy and Information Unit, Town Hall, Manchester M60 2LA, £15.

"It couldn't happen here" retorted a complacent western nuclear industry to the Chernobyl accident. The public relations success of this defence was due as much to semantics and cold war xenophobia as to reactor design. Dr DON ARNOTT, a former IAEA consultant and radiation physicist in the health service, looks behind the familiar jargon to consider the real lessons from Chernobyl.

Exploding Chernobyl myths

ALL technologies acquire a glossary of terms. They are not definitions but abbreviations; sometimes not even that. Yet, since all words have meanings, these terms tend to take on meanings of their own, which, if used uncritically, can often mislead; familiar concepts get frayed at the edges, unfamiliar ones can go clean off the rails.

Nuclear terminology is particularly full of bad examples of this. And the RBMK, such as the one at Chernobyl, is a reactor so utterly unfamiliar to us that we shall never understand either the nature of the explosion or its significance unless we make a bonfire of misconceptions caused by using terminology parrot-fashion.

To start my bonfire I shall use an example which, though a little off-beam, furnishes a short and clear example of the difficulty we face. Consider the Fast Breeder Reactor (FBR). It produces more plutonium than it consumes; and the term suggests that it does so rapidly. Alas, the FBR is no nuclear rabbit. What is 'fast' is the unmoderated chain-reaction; the breeding process itself is so slow that doubts have been raised as to its utility. Yet the term 'fast breeder' persists to suggest the contrary – and insidiously it creeps into the thinking of those who do not understand how the FBR actually works (and even, to some extent, those who do).

Immoderate

The next example will bring us back to Chernobyl. Our view of thermal reactors – Magnoxes, AGRs and PWRs – is seriously flawed.

We think – do we not? – of the moderator, graphite or water, slowing down neutrons to give a nice controllable chain reaction. Nothing could be further from the truth. The purpose of the moderator is to increase the efficiency of the chain reaction and has nothing to do with safety. The source of the heat, which we seek to extract and use, is U-235 fission, and this is more efficient if the neutrons are slowed down. And there is no such thing as a slow fission; all are energetic and immediate (the term used is prompt) and the secondary neutrons

emitted, which go to sustain the reactions are energetic and typically prompt as well. In fact the difference between a fast reactor and a thermal one is not absolute. Why, then, can the latter be controlled at all?

Control is possible because a small but consistent fraction of the secondary neutrons – about 1% – are delayed in emission, from 1 to 10 seconds. Matters are arranged such that the reactor cannot go critical at all without the participation of the delayed neutron fraction. However, the margin of safety is not quite as slender as it sounds; yet how few realise the truth of the matter, still less its implications. For if, by any combination of circumstances the delayed neutron reaction is over-ridden by the more abundant prompt neutron reaction, control is irretrievably lost and the result is nuclear explosion in the reactor.

That is what happened at Chernobyl.

Public story

For years past the theoreticians of the Industry must have known the truth, yet the public story has always been that it couldn't happen, primarily because of the superabundance of non-fissile U-238 in the fuel. And so incomplete has our understanding been of the way thermal reactors work that we have believed it. (I admit that this is what I "thought" until Chernobyl started me thinking.) But until one realises that a thermal reactor is in fact a fast reactor made controllable by careful use of the delayed neutron fraction, this particular what-happens-if ... is not even a question. Now it must be. This is the first lesson of the Chernobyl accident. It requires brand-new thinking.

The next of our misconceptions to go onto the bonfire arises out of our preoccupation, naturally enough, with reactor types with which we are familiar. It is that we have come to equate pressurisation with containment. In fact they are functionally separate. The function of pressurisation in gas cooled reactors and PWRs is simply heat efficiency: coolants under pressure raise steam more effectively. It is a design feature of our reactors that the entire core is contained within the pressure vessel.

This doubles as containment. But that is a bonus.

By contrast the purpose of containment is to contain volatile radioactive releases. The essential feature of the pressure vessel is that it must be gas-tight. But mechanically it need be no stronger than is required by the reactor design as a whole.

Different by design

The RBMK too uses pressurised water as coolant, but the design is very different. The graphite core is perforated, vertically, by Zircaloy standpipes which contain both the fuel and the coolant water (at slightly more than half PWR pressure). Any standpipe can, in the event of leakage, be isolated from the rest – about 1,700 of them – and repaired.

The tubes are pressurised; the core is not. The containment is a thin steel shield through which inert gas flows at slight positive pressure to cool the graphite. Far be it from me to defend the RBMK; the fact remains that the containment proved perfectly adequate both in normal operation and for the sort of repair just mentioned.

The reactor rests upon a massive concrete base; it is surrounded by water tanks whose function is radiological protection; and on top there is a massive pile cap, also of concrete, which is traversed by the standpipes carrying the heated water out of the core. (At this point they are of steel, welded to the zircaloy tubes where they leave the core – the point is important later.)

Outside of the containment all of this structure is unpressurised, in fact in communication with the atmosphere. On first acquaintance it sounds a bit slap happy. And the RBMK design has been criticised for its lack of pressurised containment. This simply serves to show how dangerous preconceptions can be when applied to circumstances where they are inappropriate. In fact, had the containment been pressurised the disaster, bad though it was, would have been incomparably worse.

It may be a little far from the Ukraine, but the easiest way to understand this is to consider what happens when a

fission bomb explodes. A bare sphere of plutonium goes supercritical at a mass of about 5kg. It then blows itself apart in a relatively inefficient explosion, most of the fissile material being unused. But the chain-reaction is proceeding about 1,000 times faster than any known chemical or physical process; and, if the reacting mass can be held together, even for a millisecond, by a steel tamper, the chain reaction multiplies many fold and a vastly more violent explosion results.

One further input before I draw the threads of this story together. Most people have seen film of an air-burst fission bomb. It starts with a blinding and nearly instantaneous flash. It seems almost inconsequential; yet in that instant the whole destructive energy of the nuclear explosion is released. It then proceeds to act upon whatever lies in its path. Distinctly later the mushroom cloud appears, and grows. It is responsible for nearly all the subsequent damage. Yet it is not, in itself, a nuclear event but the consequences of one. In analysing the Chernobyl explosion it is necessary to make a clear distinction between cause and consequence. To this analysis I now turn.

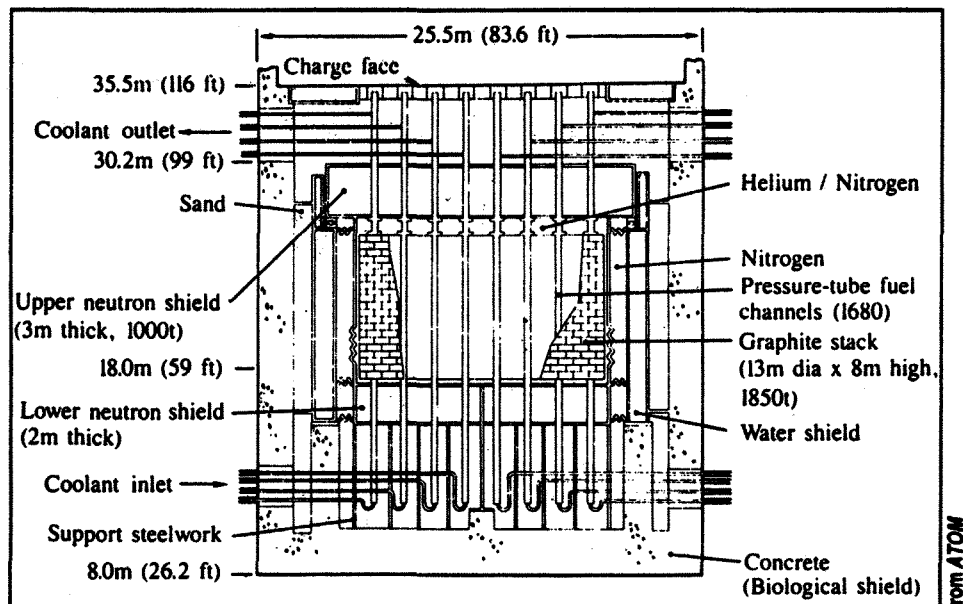
Consequences

In doing so I am not concerning myself at all with what actually caused the nuclear explosion. Steve Martin and I gave an essentially correct description of this in *SCRAM 64*, but this has been overtaken by far more detailed studies which, however, only further confirm that the initiating cause was nuclear, not chemical. Here I am concerned with consequences, not causes.

The inventory of nuclear energy released, virtually instantaneously, was somewhat less than 0.3 kilotons. This is an excess of the energy generated by smaller battlefield nuclear weapons. The temperature generated was sufficient to part-melt the uranium oxide fuel, that is, well in excess of 2,500°C.

The containment will have been destroyed instantaneously; so too will the steel-zircaloy welds I referred to, which do not resist high temperatures. Freed from attachment to the core the pile-cap, now only resting on rollers, lifted. Totally depressurised, and now in communication with the outside world, the reactor core simply blew itself apart, extinguishing the nuclear event in so doing – much as the bare sphere of plutonium I have instanced above.

There was a story that the pile-cap was



A cross-section showing the general construction of an RBMK reactor

blown from horizontal to vertical in one piece, like the flinging open of an enormous door. Had this happened it would have been a miracle; the thing weighed over 2,000 tons and would have continued to travel, there being nothing in the reactor control room – which is where it would have landed – to stop it.

What actually happened was that it dropped into the reactor chamber, being held more or less vertically as it did so by the enormous force of the disintegrating reactor – virtually the two changed places; that is where it is now, though nothing now remains of the core.

Enormous force

The enormous explosive force into which the nuclear energy inventory transmitted itself was mostly steam, though there were other contributions. But what sort of steam was this? It lay outside all previous experience; steam at 2,000°C will behave as a perfect gas; it is also part ionised and part dissociated into free hydrogen and oxygen at temperatures far too high for recombination. A better picture emerges if we describe it as a colossal gas explosion; our prior knowledge of steam explosions has misleading associations.

The damage is too-well known to require description.

But assume, now, that for some reason the core had been enclosed in a pressure vessel of the sort with which we are familiar. No pressure vessel could have withstood such force. What it would have done was to have maintained its integrity for that fraction of a second necessary to allow the chain reaction to have multiplied enormously, thus

resulting in a far worse explosion. In other words it would have acted exactly as a tamper does in an 'efficient' nuclear bomb.

The missiles from the detonating pressure vessel would have been sufficient to destroy any other containment of the 'dustbin' sort, familiar to us in pictures of PWRs. The other 3 reactors in the park would have been disabled if not destroyed and the spent fuel store they shared would probably have sustained even more serious damage.

Novel question

The serious, and novel, question which now faces us as the main lesson of the Chernobyl explosion is this: can any combination of circumstances, no matter how improbable, produce a prompt neutron explosion in our reactors; and with what consequences? The industry has already said that it is impossible – but what else would they say? They assumed this about Chernobyl and they were wrong. There is therefore no reason to assume that they are necessarily right about dangers nearer home; and we are in no way absolved by their reassurance from the necessity of examining the possibility ourselves. □

Note:

I am greatly indebted to Rob Green for the head-bashing discussions needed to produce this sort of statement; to him, too, is mostly due the fact that every statement made here, even – indeed especially – the most startling, can be referenced to the hilt. I have not included them partly to save space but principally because this is an interim statement; novel approaches to problems should not be kept under wraps but should be exposed as soon as possible to the thinking of others.

Sellafield – its official – has been chosen to play host to the nuclear industry's 'glittering prize' – nuclear waste. However, regardless of the industry's bland assurances, this has been a decision based on political expediency rather than geology. MIKE TOWNSLEY takes a closer look and presents the edited highlights of Greenpeace's latest report *Taking the lid off the nuclear dustbin*.

Deep concern

LOOMING ever closer, the 1994 nuclear review is the gauge by which all else is measured. "It is clear," say Greenpeace, "that if the review is to find in favour of more nuclear power stations, the industry must convince the public that it has found a solution to the problem of what to do with its ever growing mountain of nuclear waste."

Geologists, unlike political pundits, would never have tipped Sellafield to win the nuclear dump race. In 1980, the Institute of Geological Sciences (IGS) – now the British Geological Survey (BGS) – reviewed all existing nuclear installations in the UK to assess their suitability as a waste dump sites. Sellafield was examined and rejected as unsuitable. Dounreay and Drigg were also counted out as having no suitable geological formations at shallow enough depths. Deeper formations were ruled out because they are difficult to explore and predict, involving considerable expense.

In 1983 the UK Nuclear Industry Radioactive Waste Management Executive – the acronym Nirex later becoming its official name – was set up. It was exclusively charged with the task of finding a final resting place for low and intermediate level nuclear waste – no Government policy exists on what to do with high level waste.

The Tory four

One year after their formation, adhering to the guidelines set out by IGS, Nirex named 2 candidate sites: Elstow in Bedfordshire and Billingham in Cleveland. Around 83,000 people signed a petition against the Cleveland site and it duly dropped. This left Elstow as the prime target, however, in 1986 it was joined by South Killingholme in Humberside, Bradwell in Essex and Fullbrook in Lincolnshire. Then in 1987 the Government noticed a dangerous oversight. All four were in Tory constituencies; 3 were even in seats held by Government ministers. Oddly enough, the decision to abandon these sites, in April 1987, proceeded a general election by mere weeks.

Attention then turned to a new list of potential hosts. 500 candidates, were whittled down by examining various

criteria including geology, environmental impact and planning implications. Further reductions were then made because of "practicalities of development", the number was cut to 200. Other sites were removed in favour of those "under the control of central Government or other partners in Nirex" (ie Central Electricity Generating Board, South of Scotland Electricity Board, UKAEA, BNFL and Department of Energy). 200 became 160.

To cut a long story short, 12 sites were short listed, from which Sellafield and Dounreay emerged as "best of breed" sites. No details have been forthcoming regarding the remaining 10 areas. However, Nirex retain the right to investigate them further if necessary.

Four criteria were used to produce the list of 12:

- Safety both while the waste is being deposited and after the dump is closed;
- Socio-economic and environmental impact including the attitudes of local communities to the nuclear industry;
- Robustness or predictability of site geology, and ability to intervene to take remedial action following closure;
- Cost.

The dubious duo has now, of course, been reduced further. Sellafield is designated as a Busc site (Basement rock under sedimentary cover) and its Borrowdale Volcanic Series is favoured as the repository medium. They are a complex series of slightly metamorphosed (transformed by heat and pressure) volcanic rocks making up the central part of the Lake District.

The 1980 IGS survey highlighted the problem of forming the required three-dimensional picture of Borrowdale Volcanic rocks: "the nature of volcanics ... is speculative and a detailed predication of the volcanic succession cannot be made". Faulting within these rocks will be extremely difficult to predict and map and "limits the value of extrapolating formation depths from distant bore holes".

Test drilling began at Sellafield in July 1989. The first borehole was drilled to the

west of the site. However, it had to be abandoned when it failed to penetrate the Borrowdale Volcanic rocks at a depth of around 1,189m. A second bore began on 25 August 1990 to the east of the Sellafield site near Gosforth. It faltered at 467m, a replacement was started later that year.

Detailed interpretation of borehole results takes about 12 months from the start of drilling. To claim to be able to choose Sellafield, in preference to Dounreay – or anywhere else for that matter – on the basis of 2 boreholes, one of which was incomplete, and as yet limited interpretation of vast amounts of complex data, is to say the least premature.

Model uncertainty

Given the nature of these volcanic rocks, a large number of boreholes and geophysical investigations would be necessary to even begin to understand enough to enable modelling of groundwater flows to proceed. Unfortunately, the models needed to carry this out do not exist, and even then, there are so many uncertainties concerning radionuclide behaviour and migration, it may never be possible to accurately model the real situation. However, so confident were BNFL and Nirex that the site would prove suitable, that on 16 April 1991 a fourth borehole was started very near the site of the second. Planning permission was granted in January of this year for 2 more in close proximity.

Nirex call this phase 2 of their site investigation, which was not initially to be started until Sellafield was chosen. A programme of up to 20 boreholes is apparently planned, but complete data from all the boreholes will not be available to a public inquiry which is planned for 1993. The Inquiry will also be held prior to the results from the test bores being put up for peer review.

Nirex board member, Dr Ron Flowers, argues that the public inquiry should concern itself only with simple planning matters, and contends that the adequacy of the geology is a matter for the regulatory bodies, such as the Nuclear Installations Inspectorate. Indeed, Nirex admitted in January that it "will only be in a position to [present a full safety case] once the repository is actually built." This

situation is "unsatisfactory" according to Professor John Knill, chair of the Government's Radioactive Waste Management Advisory Committee (RWMAC). RWMAC have suggested a 2 stage inquiry, the first to deal with infrastructure and approval for an exploratory deep shaft, and the second dealing with the full safety case.

While the announcement of the preferred site has in fact taken a year longer than was estimated in the Nirex's 1989 Preliminary Environmental and Radiological Assessment (PERA) document, the inquiry according to the current timetable will be held well before 1994/95 as originally envisaged. One possible explanation can be gained from comments made in RWMAC's 1989 annual report: "If slippage in the planned completion date were to occur then not only would the opening date for the deep repository be delayed but there would also be knock-on effects on low- and intermediate-level radioactive waste management practice and strategy."

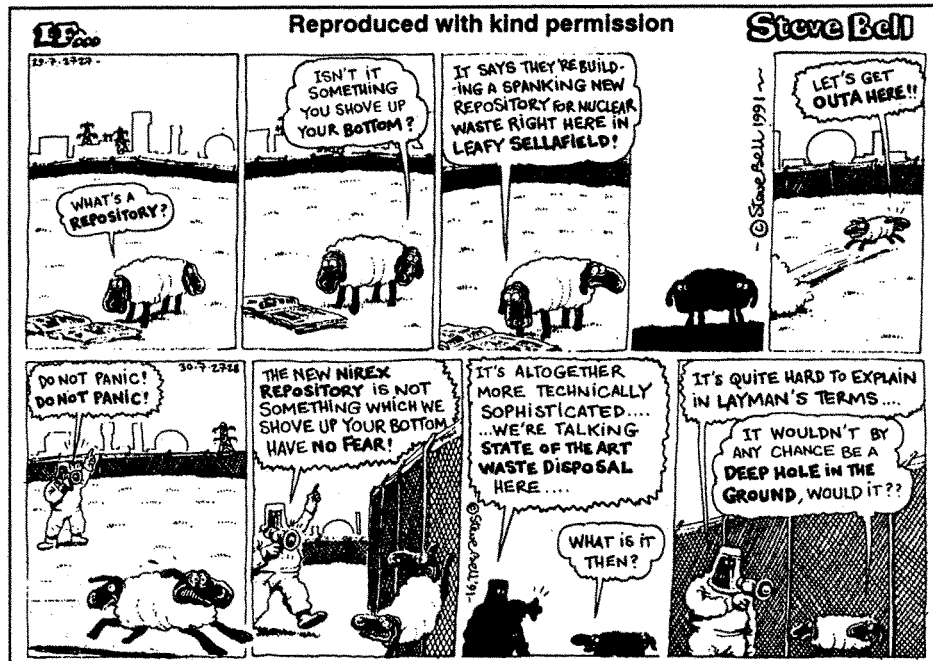
So far no site specific design exists for Sellafield. One was produced prior to selection, however it was not for the host rock now envisaged. Instead they are turning to the Dounreay hard rock design, which itself is based on oversimplified geology used for a radiological exercise in 1988.

Integrity

Deep disposal, as planned, depends on the integrity of containment, which must be reliable for many thousands of years, and ensure that any subsequent releases of radioactivity will not result in unacceptable radiological risks to either present or future generations. Nirex propose the 'multi-barrier' concept, which makes use of both engineered and natural barriers. Any assessment of safety would necessarily have to involve a calculation of the effectiveness of each barrier in preventing or retarding the movement of radioactive substances.

An enormous amount of doubt has been expressed over the validity of this approach and in particular over the highly complex computer models being used to evaluate the site. At the 1989 Organisation for Economic Cooperation and Development (OECD) Nuclear Energy Agency conference, held in Paris, many experts expressed concern over the possibility of modelling the natural world adequately. To quote one speaker: "The more you look, the more you need to look."

Originally the deep design was being touted on the basis that it would be sealed, requiring no further human intervention after closure. However, following a public consultation exercise



launched in 1987, Nirex found "recoverability of the wastes was generally deemed to be important. It was a principle concern for those who proposed above-ground storage." While admitting that retrievability would be difficult and that 'schemes for vault monitoring and waste retrieval must not compromise the integrity of the repository', they are now talking of using a new 'soft concrete' backfill which would make it possible. No details on this have so far been released, with 'commercial confidentiality' being cited as the reason.

Gas generation

One of the most important potential routes by which radioactivity could leak out of a repository, and back to the surface, is the gaseous pathway. Gas will be generated by microbial action on organic material in the waste itself, and by the corrosion of concrete and steel structures, caused by water which enters the repository. If the gas is unable to escape, pressures may rise, this could damage the engineered structures or open fissures in the rock, which could in turn affect groundwater movement. The volume of hydrogen alone that would be generated would be roughly equal to the volume of the waste itself every year for up to a few thousand years.

Forsmark in Sweden, commissioned in 1988, has been held up by the nuclear industry as an example of a working repository. Plane loads of local counsellors and journalists from both Dounreay and Sellafield have arrived there at the expense of Nirex Sight-seeing Tours plc. Yet, problems with gas generation have not yet been solved. This has left the shallow sub-seabed dump without a full licence for intermediate-level waste, 90% of the total radioactivity

destined to be held there.

However, allowing the gas to escape could provide a route for radionuclides also. A recent Department of the Environment study concluded that research into gas generation and migration is "very much in its infancy ... considerable further work is therefore needed before the effects of gas migration could be included in a full assessment of disposal." Quite how Nirex can name a site suitable for development when there are such major uncertainties surrounding the principle of the repository design is bewildering.

The nuclear industry often claim that an international consensus exists for the claim that deep disposal of nuclear waste relies on proven technology. However, if this were true, why throughout the OECD is the need for in-situ research accepted. In several of these countries it is intended to develop complete pilot repositories, which will never be used for actual waste disposal.

Only in the UK is it planned to 'learn on the job', and it is only in the UK that there is a lack of any firm proposals for the integrated management of all radioactive wastes, including high-level. The nuclear industry should address the waste problem in a unified and realistic way. There can be little confidence in an exercise which, having searched the whole UK mainland and continental shelf, identifies a nuclear site as the best candidate for a nuclear repository. □

* Taking the lid off the nuclear dustbin: A geological critique of Nirex's attempts to find a deep disposal site for nuclear waste at Sellafield and Dounreay, by P J Richardson BSc CGeol FGS, Consulting Geologist. Greenpeace; July 1991, 44pp, £5.00 + £1.50 p&p.

At the beginning of July, Friends of the Earth (FoE) launched a campaign to make the future renewable. MICHAEL HARPER, FoE's Renewable Energy Campaigner, explains what the campaign hopes to achieve and how you can help. The development of renewables is at a crucial cross-roads, needing the full support of everyone interested in energy and the environment.

Energy without end

WITHIN thirty years, renewable sources of energy, taken together, could be as significant to our entire energy system as coal is today. In short, Friends of the Earth's (FoE) new renewable's campaign is trying to redress the gross lack of Government vision which is impeding the full and sensitive development of renewables.

A new report, *Energy Without End* by Dr Michael Flood⁽¹⁾, has been published to coincide with the campaign launch. It is a complete revision of an earlier report (*Energy Without End*, 1986) in order to reflect the changed situation: technological developments; the widespread recognition of the need to act against the threat of climate change; privatisation of the electricity supply industry and the introduction of the Non-Fossil Fuel Obligation (NFFO) for England and Wales.

Assessing possible future contributions from different technologies (wind, 'biofuels', solar, hydroelectricity, tidal, wave and geothermal), the report shows how they might integrate into the UK energy system (see graph). It analyses the barriers to development and concludes that the principal blocks are political rather than technical. It is here, in the political arena, that FoE is focussing its energies, aimed, primarily, at the Ministerial Review promised in the White Paper on the Environment and due to begin this Autumn. The Government has declared that this will be a fundamental review of all aspects of renewable energy strategy for the UK (SCRAM 81).

Energy Without End identifies wind power and 'biofuels' (organic wastes, or crops grown specifically for fuel use) as the two resources which can make the biggest contribution to meeting UK energy needs in the short term. In the longer term, a number of other resources could become important, including solar, tidal and wave energy.

The UK's wind resources are amongst the best in the world. Over the last decade, more than 20,000 commercial-sized wind turbines have been erected world-wide. The problems that dogged many of the early machines have now been sorted out. Turbine performance and reliability have also

dramatically improved. The UK could aim to have at least 2,500MW of installed wind energy capacity in place by 2005. (For comparison, a large nuclear power station has a capacity of about 1,200 MW.) This would include initial development of the UK's large off-shore potential.

A wide variety of technologies for generating energy from biofuels are available and, in principle, different types of biofuels can be used in a number of ways. For example, domestic refuse, wood waste and straw can be burnt directly to provide heat and electricity, or converted into gas. Alternatively, they can be broken down mechanically or chemically and digested to generate 'biogas', a combustible mixture of methane and carbon dioxide. Taken together, all types of biofuels could produce heat and electricity amounting to over 7% of the UK's 'primary' energy use by 2020⁽²⁾.

Solar power

Despite its northern latitude, the UK receives roughly half as much solar energy as some of the sunniest parts of the world. Though currently year-round solar heating is impractical due to seasonal swings in availability, there are other steps that can be taken.

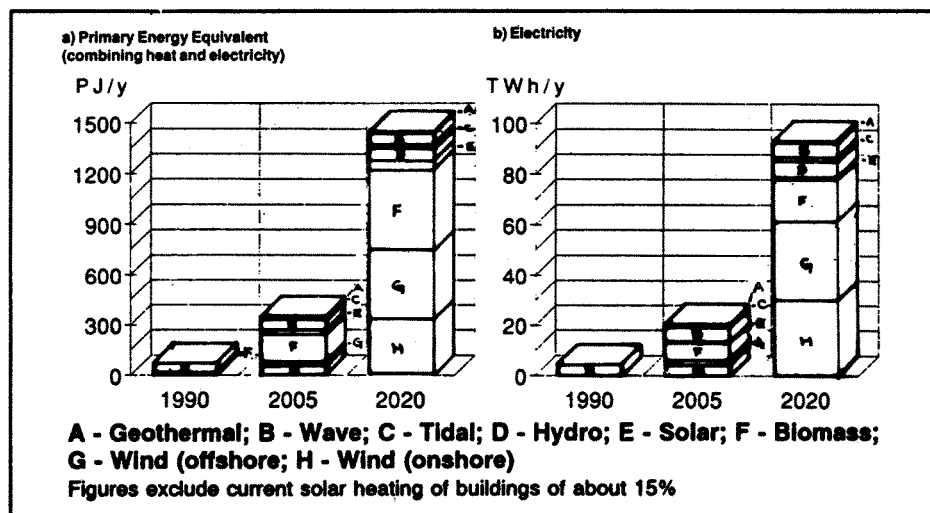
Buildings with large south-facing and small north-facing windows and high levels of thermal insulation can trap solar energy and store it as heat within the structure. Over the past decade, hundreds of thousands of buildings

incorporating these so-called 'passive solar' features have been erected.

The price of solar cells ('photovoltaics'), which already provide power for refrigeration and water pumping in hot desert regions, has fallen dramatically in the last few years. A recent Government report suggested that photovoltaics could be an economical power source for the UK within ten years, if installed in the walls or roofs of new buildings.

About 50 large hydroelectric schemes and more than 20 smaller ones are operating in the UK, producing about 10% of Scotland's electricity (just over 1% for the UK as a whole). Most schemes rely on dams to impound water in reservoirs; others rely on the diversion of water from a river through turbines. Hydro-electricity provides some of the cheapest power generated in the UK, as the initial investments are now paid off. New schemes would be more expensive. It may be possible, however, to increase the contribution from hydroelectric power to about 5% of current electricity use.

Tidal barrages can be built across bays or estuaries where there is a high tidal range. There are none currently in operation in the UK, but the technology is reasonably well understood and several proposals have been made. It is estimated that technically, estuarine tidal power could meet one sixth of the UK's current electricity demand, though in practice, the environmental implications of tidal barrages are an important restraining factor.



Possible future contributions from all renewable energy by 2005 and 2020

In recent years, many different wave energy devices have been proposed and a number of prototypes have been built. Some are shore-mounted, others are designed for the deep sea environment where the energy content of each metre of wave can be equal to that needed to power 50 single bar electric fires. As an island, the UK is well-placed to tap the large energy resources of ocean waves. However, the UK's wave energy research programme, which led the world in the 1970s, was dismantled in 1982 following a controversial Government Review. If the technical challenge can be met, estimates suggest that wave energy could supply between one-sixth to one-third of current UK electricity needs.

Hot rocks

Within the top ten kilometres of the Earth's crust there is sufficient heat to meet all of the UK's energy needs for hundreds of years. Whether we can tap into this resource will depend on the development of Hot Dry Rock geothermal technology, which involves pumping water through rock which has been artificially fractured, and then recovering superheated water or steam. The technology is still at the experimental stage and its suitability for the UK is not yet certain. Lower temperature heat, suitable for space and water heating, can be recovered from much shallower depths using conventional techniques. This is now being achieved on an increasing scale, in Hungary, the Soviet Union and France, for example.

The analysis in *Energy Without End* of the political barriers forms the foundation to the FoE campaign. It is probable that the Government Review will define a strategy for the next ten years and thus a 'successful' outcome will be critical for achieving a significant deployment of renewables by the year 2000 and beyond. The campaign will therefore focus on the four key obstacles identified in the report and attempt to ensure that the Government Review adequately resolves these obstacles.

1. There needs to be a major restructuring of the NFFO obligation lottery. While it has potential to form the basis of a renewable energy deployment programme, it requires substantial revision to avoid suffocating potential projects. For example, according to a FoE survey of the number of potential wind energy projects under the 1991 Obligation, Government expectations have been exceeded by two to four times⁽⁹⁾. Unless current Government thinking is revised, up to 75% of the projects proposed may therefore have to be abandoned.

Revision needs also to ensure that the potential of Scotland and Northern



Denmark's largest wind farm at Velling, with 100 turbines and a capacity of 13MW.

Ireland is integrated into a consistent UK policy.

2. The Government has recognised and accepted the principle of intervening in energy policy to bring about certain objectives: for example, with lead-free petrol and with the Non-Fossil Fuel Obligation in order to maintain diversity and security of supply (and prop up the failed nuclear industry). It is a natural and necessary progression of the Government's policy that this type of intervention is applied to renewable energy technologies. This involves the explicit recognition of their overall environmental benefits compared to conventional technology in respect of, for example, greenhouse gas emissions and the threat of nuclear accidents.

By perpetuating a system which fails to take account of the environmental costs of electricity production, the Government is maintaining a gross distortion in the market which thereby fails to allocate national resources optimally.

3. There must be the creation of a Renewable Energy Agency to implement a national deployment and research strategy. The Agency would need to address the training, education and technical issues arising from an expanded programme for deployment and research. Its work would remain overseen by a strengthened Division within the Department of Energy.

4. Most importantly, there must be a national vision, symbolised by the adoption of realistic targets for renewable energy replacing the paltry 1,000MW set by the Government in the Environment White Paper. FoE has challenged the Government to set a target of 3,500MW of new electricity generating capacity

with a view to achieving 25% of total primary energy from renewables by 2020.

If energy policy were determined on the basis of environmental necessity and common sense, then FoE would not need to campaign. But there are many vested interests representing both generators and distributors, who remain determined to ensure that renewable sources of energy stay on the periphery of UK energy policy. In addition, when it comes to advancing clean energy technologies, we have a Government debilitated by lack of vision.

This is why FoE is calling on as many people as possible who are interested in a safe and sustainable energy policy to register their support for renewable energy by writing to their MP now. The Review of renewables could scupper the chances for renewables. If, at this critical moment, people can voice their support for renewables to the Minister chairing the Review, Colin Moynihan, via their MPs, then another false start for renewables can be avoided. Help make the future renewable. □

Notes:

1. *Energy Without End* (1991) by Dr M Flood, Friends of the Earth. (For details see book review page 26/27.)

2. 'Primary energy' is the heat content of any fuel before it is processed and transmitted to the consumer. The 7% figure assumes a 30% reduction in total primary energy through improved energy efficiency.

3. The Secretary of State announced in December 1990 he expected 60 to 120 MW (installed capacity) of wind energy to be accepted under the 1991 NFFO. Proposals identified by FoE total about 250 MW.

An exciting international initiative on environmental protection proposed by nuclear free local authorities in Scotland has been thwarted by a combination of government bureaucracy and cold war ideology. STEVE MARTIN, the project's coordinator, describes the background and corrects some inaccurate and misleading information which appeared in the press.

Radiation survey ship banned

"BRITAIN Bans Soviet Spyship" screamed the front page headline of the *London Evening Standard* on 10 June. The story reported that the Foreign Office had refused clearance for a Soviet research vessel to conduct an environmental monitoring survey in British coastal waters because "elements of the research programme were unacceptable."

Central to the report was an allegation made by Menzies Campbell MP, Liberal Democrat Defence Spokesperson. Campbell had written to Defence Secretary Tom King the previous week warning him that the 'Akademik Boris Petrov' carried equipment which could trace nuclear warheads, and that "this obviously raises very considerable implications for national security, particularly if this vessel were to be admitted to UK territorial waters in the region of the Rosyth dockyard and the associated naval base." He urged the Defence Secretary to prevent the visit.

Several other newspapers covered the Foreign Office decision, although not all in such Cold War terms as above. The reality, however, is inevitably less sensational and considerably more complex than reported.

The enterprise dates back to November last year, to the 5th International Conference of Nuclear Free Zone Local Authorities. Glasgow City and Strathclyde Regional Councils hosted the three day event which attracted 400 delegates from 22 countries, including for the first time contributions from the Soviet Union and the Eastern Bloc. The Mayor of Archangel, a strategic port on the White Sea and the first Soviet Nuclear Free Zone, attracted considerable media attention.

Issues covered at the Conference ranged from the arms race, through international nuclear materials trade and environmental issues such as Global Warming, to sociopolitical issues including relationships between the Developed and Developing Countries. It was widely agreed that the dialogues set up would prove vital in future discussions, and that local authorities could have a unique role to play in encouraging detente and international development.

During the Conference, informal discussions were held between representatives from Nuclear Free Zones (NFZ) Scotland and scientists from the USSR Academy of Science's Vernadsky Institute of Geochemistry and Analytical Chemistry in Moscow.

The Institute owns and operates the 860 tonne, 75m long 'Akademik Boris Petrov', one of three scientific research vessels specially designed and built in Finland. Its purpose is to sample and analyse atmospheric and marine pollution, and it is equipped with a sophisticated array of scientific equipment, including an integrated system of computers, measuring and analysing equipment and system software.

Chernobyl studies

It has been used previously to determine the radioactivity of rivers and seas of the European part of the USSR following the 1986 Chernobyl accident, and the site of the sinking of a Soviet nuclear submarine in the north Atlantic in 1986. It is also being used for continuous monitoring of the European seas (Black, Mediterranean, Northern, Barents, Baltic and Norwegian) to study effects of the Chernobyl accident and nuclear power station discharges.

The Soviet scientists described the programmes of research they were undertaking in European waters, and suggested that they continue this work into British waters to enable a fuller picture of Chernobyl fallout to be established. The equipment would also be able to track the progress of radioactive discharges from Sellafield, Dounreay and other civil and military nuclear establishments as they are carried by the tidal currents.

As well as environmental monitoring equipment, the Boris Petrov can carry a Soviet-designed unit which is capable of detecting the presence of nuclear warheads and nuclear reactors on-shore or on board other vessels. Whilst being excited by the opportunity presented by such technology for arms control verification, NFZ Scotland quickly realised that its inclusion in the proposed research package would prevent government clearance being granted. To this end, the Soviet team

was informed that this equipment should be dismantled and removed from the vessel before it enters British territorial waters - the Soviets agreed.

A Statement of Intent was signed in Moscow, and the Soviets agreed to draw up an application to the Foreign and Commonwealth Office (FCO) seeking clearance for the work. This was sent on 6 May via the Soviet Embassy. Contact with the FCO that week gave no cause to believe that the application was in any way controversial, indeed it was expected to be treated in a routine manner, with a decision due within a couple of weeks. Subsequent discussions did not alter that impression.

Meanwhile, all British Nuclear Free Local Authorities and selected non-NFZs were circulated with a view to obtaining support for the survey. The authorities were asked to agree to the survey in principle, pending government approval, and to pledge financial support towards the estimated £35,000 costs. Because of the tight timescale - the circular was sent out at the beginning of May, and the survey was proposed to take place in mid-June - the target was felt to be a challenging one to reach.

Financial support

A press notice outlining the research programme was released in late-May, and attracted great interest. In all cases, both national and local, the coverage was sympathetic. TV and radio also carried the story.

Pledges of financial support began to arrive from late-May, often achieving a few column inches in local papers or a couple of minutes on local radio. Within a month of the financial appeal over £20,000 had been pledged, an encouraging achievement considering council committee cycles are seldom less than 6 weeks in duration. Also, an unexpectedly high interest was demonstrated by authorities without a coastline, and those well off the route of proposed voyage. Indeed some councils expressed an interest in hosting a port visit by the vessel, and requested that the survey be extended to their area.

Although authorities outwith the

proposed itinerary could have found it legally difficult to support a venture of this nature because it could be argued not to directly benefit their own citizens, many recognised its importance and agreed support on the defensible grounds that many of their citizens eat seafood and take their holidays on the coast. In short, the project had caught the popular imagination. Even non-NFZs pledged support for what was seen as a valid venture proposed by local authorities as part of their environmental protection responsibilities. By late-June the total pledged had passed the target.

Then things turned sour. Menzies Campbell MP released to the press his letter to the Defence Secretary, and the spectre of the 'Soviet threat' was resurrected. Liberal Democrat councillors in Fife - Campbell is MP for North East Fife - continued the campaign in the local press, branding the vessel as a "spy ship".

The main plank of this argument was an exploratory note signed at the November conference between NFZ representatives and Soviet scientists which "agreed to give serious consideration ... to the demonstration of radioactive detection technology for the verification of nuclear warhead presence aboard military vessels and environmental monitoring." This note was signed in order to facilitate negotiations between the scientists and their superiors, and was deliberately wide-ranging.

Moscow visit

The subsequent visit to Moscow, when NFZ representatives were shown the sensitive technology, resulted in a second document being signed, which superseded the first, specifically rejecting the inclusion of this technology in the visit. No mention of this, or subsequent documents, has been made in the 'spy ship' sensationalism. Indeed, in the report back to the NFZ Scotland Steering Committee, the equipment, a two part system comprising a large shipping container and a medium suitcase-sized unit, was described as "large and relatively easily identified", making it possible to insist on its not being present on the British tour.

Following the allegations in the press, contact was made again with the FCO. This time the response changed: the application had been taken to ministerial level for a decision, an unusual step. On 9 June, the day before the government refusal was made public, the Scottish edition of the Sunday Times ran a front page story headed "Soviet 'spy' ship banned from Scottish waters", in which government ministers from three departments were quoted: Scottish Secretary Ian Lang was said to be "furious with his



officials" for not opposing the trip; Defence Minister Alan Clark described the visit as "monstrous ... do the Russians invite us to look for nuclear warheads in Vladivostok? It is a demented idea, even for the loony left"; and Mark Lennox-Boyd, under-secretary of state at the Foreign Office, said "If it enters British waters it will be asked to leave."

Capability and purpose

A Parliamentary Answer from the Foreign Office reveals Government knowledge of the vessel's capability and purpose: replying to Martin O'Neill, Shadow Defence Secretary, Mark Lennox-Boyd said on 14 June, "We understand this vessel is equipped for the detection of radioactivity levels." No mention of sensitive warhead detection technology on board the vessel during its British survey trip. How could Alan Clark have got it wrong?

Armed with this information, NFZ Scotland wrote to the Foreign Secretary urging him to reconsider the application. In the reply of 5 July three specific reasons were offered for the refusal: the application was submitted late (three months' notice is normally required); the Soviet authorities refused the British research vessel "Cirolana" entry into their waters in 1989; and, the primary reason, "the areas around the Clyde and Forth where the vessel wanted to carry out research have defence installations nearby and are therefore highly sensitive."

I have since learnt from the Foreign Office that the rule on notice required is often interpreted flexibly. So that leaves the traditional tit-for-tat tactic, and the defence interests argument. If we discount the former, we are left with the question of why the British Government are wary of environmental radioactivity surveys near submarine bases. What have they got to hide?

Apart from the environmental protection element of the project, and

the fact that the Soviets were offering the package at less than half the cost of securing a similar one from a British vessel, NFZ Scotland was keen to cooperate with Soviet scientists because, "in the current climate of detente and international scientific cooperation ... an opportunity such as this is too good to miss."

The Government seems to disagree. Since the Berlin Wall was toppled on 9 November 1989 - coincidentally the same day that the nuclear power component was ignominiously pulled from the electricity privatisation programme - governments on both sides of that erstwhile political barrier have been encouraging collaboration with the Soviet Union and Eastern Europe at all levels. To refuse an application for basic scientific research in the area of environmental protection at a time when such work is apparently championed by ministers is to clearly indicate that statements about a new world order are no more than empty rhetoric.

As Cllr Iain MacDonald, convener of NFZ Scotland, has said: "By refusing permission for this work, the Government has shown that it wishes to control access to vital data on environmental radioactivity from local authorities and the British people." Cold War posturing is a red herring: it's the British people who are to be kept in the dark - the Soviets already know our military capability, just as we know theirs.

However, all is not lost. As I write, the Foreign Office is considering a second application to carry out the work at the end of August. All information relating to the programme, including a detailed crew list and a precise itinerary, has been provided. And they can't use the tit-for-tat tactic anymore! Those local authorities which have so far pledged financial support have agreed to keep it on hold, pending the second application, and others will consider support when appropriate.

Watch this space!

□

This year has seen the privatisation of the Scottish Electricity Industry, bringing a new framework for renewable electricity generation north of the border. STEVE IMRIE of the University of Strathclyde's Department of Economics comments on the difficulties they will face, and offers some policy solutions.

Marketing Scotland's renewables

RENEWABLE energy is one of the oldest, cleanest and potentially cheapest forms of energy. Yet, in the United Kingdom less than 5% of electricity is generated from these 'alternative' energy sources. Scotland has around 55% of the UK's wind resource including some of the best sites in Europe, but the power generators operate pitifully few wind turbines.

Renewables in Scotland must now compete in the newly created market of privatised Scottish electricity utilities, Scottish Power and Hydro Electric, together with the publicly owned Scottish Nuclear. Unlike England and Wales there is no Non-Fossil Fuel Obligation or 'nuclear levy'. Instead, there is an agreement for Scottish Power and Scottish Hydro Electric to buy 24GW per annum and 34GW per annum respectively of renewable energy - predominantly existing independent hydro generation - at 5.3p/kWh, up to 1998. This last minute addition to the privatisation package was apparently facilitated by the Government writing off slightly more of the two companies debts during privatisation.

Anomalies

This new market for electricity generation contains many anomalies, and a number of changes are required if renewables are ever to achieve a significant market penetration.

One of the requirements laid down in the White Paper for the privatisation of the Electricity Supply Industry (ESI) in the UK was the introduction of competition in the market for generation, in order to increase the economic efficiency of the system⁽¹⁾. This is a laudable objective and one which I am sure most people would support. What is confusing therefore is the set-up of the market in the UK and especially Scotland, which can be seen to hinder competitive forces. There are a number of reasons, including legislative irregularities, why renewable energy technologies are finding the going somewhat tough; and indications that the

promise of 'true' competition and equal access for all are somewhat hollow.

Building a power station costs a great deal of money (up to £2 billion for a 1600MW PWR⁽²⁾). In order to borrow this capital from say a bank, you must indicate to the financier estimates of the return on the capital, chiefly in the form of electricity sales over the lifetime of the plant; via a 'Power Contract'. Obviously the longer the contract the more attractive the investment. In today's marketplace a fossil-fuel fired station can be offered a Power Contract for 20 or more years whereas say a wind farm can only be offered a guaranteed contract for some eight years as a result of the privatisation set-up. This effectively cuts the net present value of the Renewable station contract by about 35% compared to a conventional station on a 20 year contract - not a very strong marketing position⁽³⁾.

Monopoly

The Grid system is a natural monopoly. This means that it is not economically sensible to set up an alternative and rival distribution system. If you thought then that to have efficient competition everyone would have equal access to the points of demand - you'd be wrong! Unlike England and Wales, the Grid system in Scotland is to be owned jointly by the incumbent generators; a potential repeat of one of the major failings behind the 1983 Energy Act. It's been said before and must be said again that

the lack in Scotland of a NFFO and Renewable Energy Tranche is a fundamental inadequacy of the privatisation legislation in Scotland, and completely ignores the resources available in Scotland. The 5.3p/kWh 58GWh/annum quota will not apply to new schemes, severely inhibiting the development of renewables in Scotland.

The newer renewable energy technologies, that is those with few commercially operational examples, still require ongoing research. It would seem somewhat ludicrous then that the current split between nuclear research and renewable energy research within the Department of Energy's R&D budget is some £125 million to £21 million respectively⁽⁴⁾.

Overcapacity

Scotland currently has a massive level of overcapacity in terms of existing plant (current capacity is around 12GW with a peak demand requirement around 7GW). If renewables are to penetrate the market for electricity supply within Scotland, they will have to displace existing systems. This may mean that 'old' existing stations would need to be mothballed; which is arguably costly in terms of losses on the capital sunk into the conventional station.

Some supporters of renewable energy argue that the market must be viewed as a national phenomenon and not as a localised system. This means that renewable systems in Scotland could



and should be allowed to service points of demand in the South, if the Distribution Companies feel this is economically attractive. To do this electricity has to be transmitted via the existing, and upgraded Interconnector. It is surprising that this technology is owned jointly by the privatised generators in Scotland, which as in the post-1983 market can prevent access for new independent generators. It will be left to OFFER, the Office of Electricity Regulation, to rule over entry for new competitors.

These are just some examples of why the current market in Scotland is far from truly competitive, and several changes should be made.

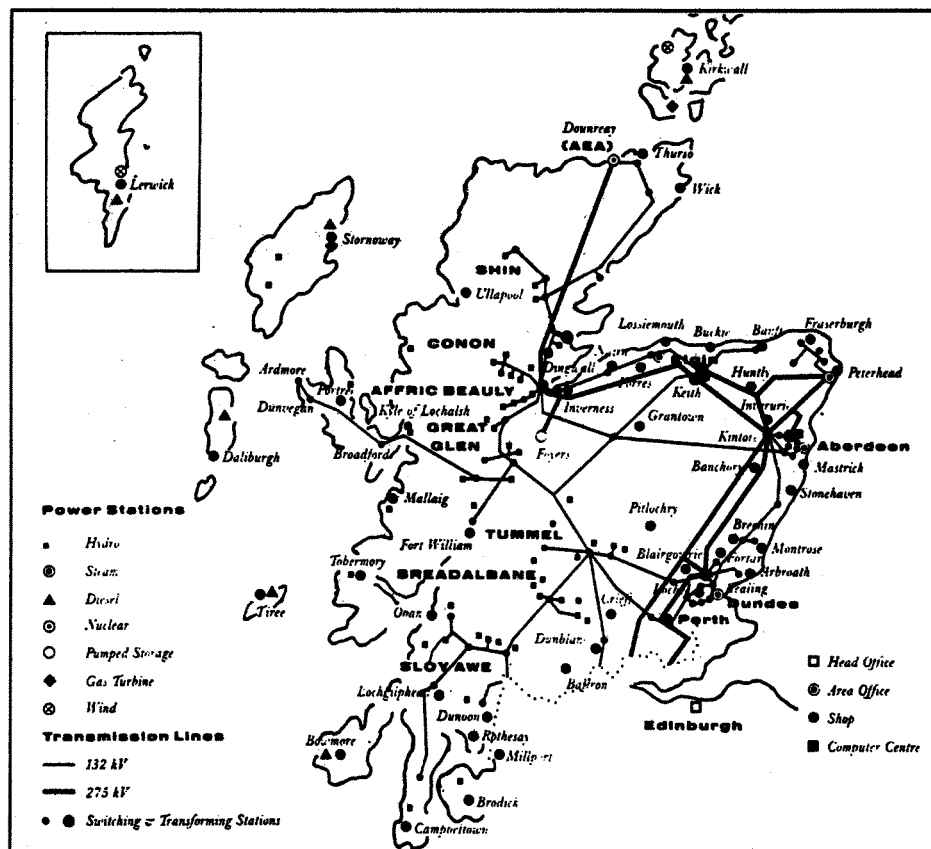
A renewable energy tranche within Scotland, for new schemes, set at minimum level of the English and Welsh example, and extended beyond 1998, is essential if renewable energy technologies are to enter the market place under the existing constraints.

The Grid

The Scottish Grid and the Interconnector should be removed from the hands of the vertically integrated generating companies and be owned by a Scottish version of, or even by, the National Grid Company. The Grid controller must be given the power to control access for new and existing generators and could operate the 'merit order system' if it is given the obligation to supply, currently in the hands of the Utilities. I offer this as a solution as it would be impractical to cleave generation from supply within the existing companies given that privatisation has taken place.

Realistic across the board pollution taxes (on CO₂, SO₂ and NO_x) on all generators are required, in order to redress some of the anomalies within the existing calculations of 'economic viability'. Care would have to be taken to ensure that the additional costs of generation (up to 5p/kWh) are met by the Utilities forcing them to adapt rather than passing on the extra costs to the consumer.

The existing generators must be part of the market for renewable technology systems, to exclude them from new projects exacerbates the difficulties in market penetration and sets up a 'them and us' situation. The benefits must be shared by all in order to help promote renewable energy and safeguard the economic viability



Hydro Electric's distribution grid

of existing generators. Renewable systems and conventional systems must be seen as complementary and compatible and not as extreme and mutually exclusive alternatives. A good example of this is the level of hydro stations operated by Scottish Hydro plc.

Gas rush

The EC Directive curtailing the use of premium fuels such as natural gas as a fuel for electricity generation should be re-introduced. This would stifle the current, short-term, profit inspired, rush to Combined Cycle Gas Turbines (CCGT) to replace coal stations. Although these stations can contribute to reducing the emissions of greenhouse and acid gases this is only partial and not near total as with renewables. If we are at all concerned with 'potential climate change' then estimates of 484 tonnes of CO₂ equivalent per GWh generated for a gas system as opposed to 7.4t/GWh for a wind system⁽⁵⁾ would indicate that the rush to 'greenhouse friendly' CCGT's is unfounded.

Finally, and to summarise, I would like to address the fundamental issue within this article. There appears to be two possible systems to adopt. A truly free market for generation, distribution and transmission of electricity in which there are no levels

of intervention or legislation in favour of any technology. We would hope then that the market would decide on the 'best' method for electricity production. An alternative market, one which I am personally in favour of, would see the market being regulated to a level which brings about a consensus solution without causing extreme financial penalties on the generators and therefore ultimately the consumer. Within the latter the issue of 'true economic viability' needs to be addressed with all supply technologies compared on like and comprehensive terms.

Unless we adopt the measures above and the market type described we will never fully utilise the renewable technologies and the benefits for all - supplier, user and future generations. □

Notes:

1. "Privatising Electricity"; HMSO, London, 1988, Cm 322.
2. Evidence given by COLA to the Hinkley Point Enquiry, T Jackson, p11.
3. "Wind Directions", Spring 1990, p4.
4. "The Guardian", 29 January 1991, p13.
5. "The Role of Renewables in Controlling the Greenhouse Effect", Energy Policy, March 1991.

The validity of the way in which radiation dose limits are set must be seriously questioned. Dr PATRICK GREEN, Radiation Campaigner for Friends of the Earth, reports that decisions are taken by a small clique of 'experts', with little democratic accountability. The dual role of EURATOM as promoter of nuclear power and setter of safeguards casts further doubt on proceedings.

Unaccountable limits

B RITAIN could be forced, under European Law, to adopt the new International Commission on Radiological Protection (ICRP) recommendations, even though the National Radiological Protection Board (NRPB) appears to be lukewarm about the proposals.

Last year the NRPB published a highly critical account of the new ICRP recommendations, when they were in draft form. This report stated the ICRP had failed to explain why its dose limits had not been reduced by a factor of 4-5, when radiation was now recognised to be 4-5 times more hazardous.

The NRPB commented that this should be justified: "The draft makes no clear-cut attempt to answer a straightforward question, that is: radiation risk factors have increased by

a factor of four to five, why have dose limits not come down pro rata."

Since then, the NRPB has attempted to sit on the fence and dodge the issue of what it really thinks about the ICRP. Its official position is that it has not reached a formal view! This is an unprecedented situation. Under the 1971 Radiological Protection Act - which brought the NRPB into existence, the NRPB has a statutory function to advise the Government on the suitability of ICRP recommendations for application in the UK. In the past, it has had no hesitation in doing this, but faced with a situation where the ICRP is actually recommending something less stringent than the 1987 NRPB interim guidance (15 mSv average for workers and 0.5 mSv for the public, compared to the ICRP's 20 mSv average for workers and 1 mSv for the

public), it would appear the NRPB is in a bit of a quandary.

The NRPB states that it will publish its view in a consultation document later this summer. In the meantime, it refuses to be drawn on what it thinks of the ICRP.

Conference irony

At the recent 7th Standing International Conference on Low Level Radiation and Health, held in Bristol in June, the Deputy Director of the NRPB, Dr John Stather, who is also a member of an ICRP committee, did not defend the ICRP when questioned from the conference floor. Stather had been presenting a talk on the new recommendations, but when questioned, ironically, he simply attempted to argue that the NRPB 1987 position was actually very close to that of Friends of the Earth (FoE).

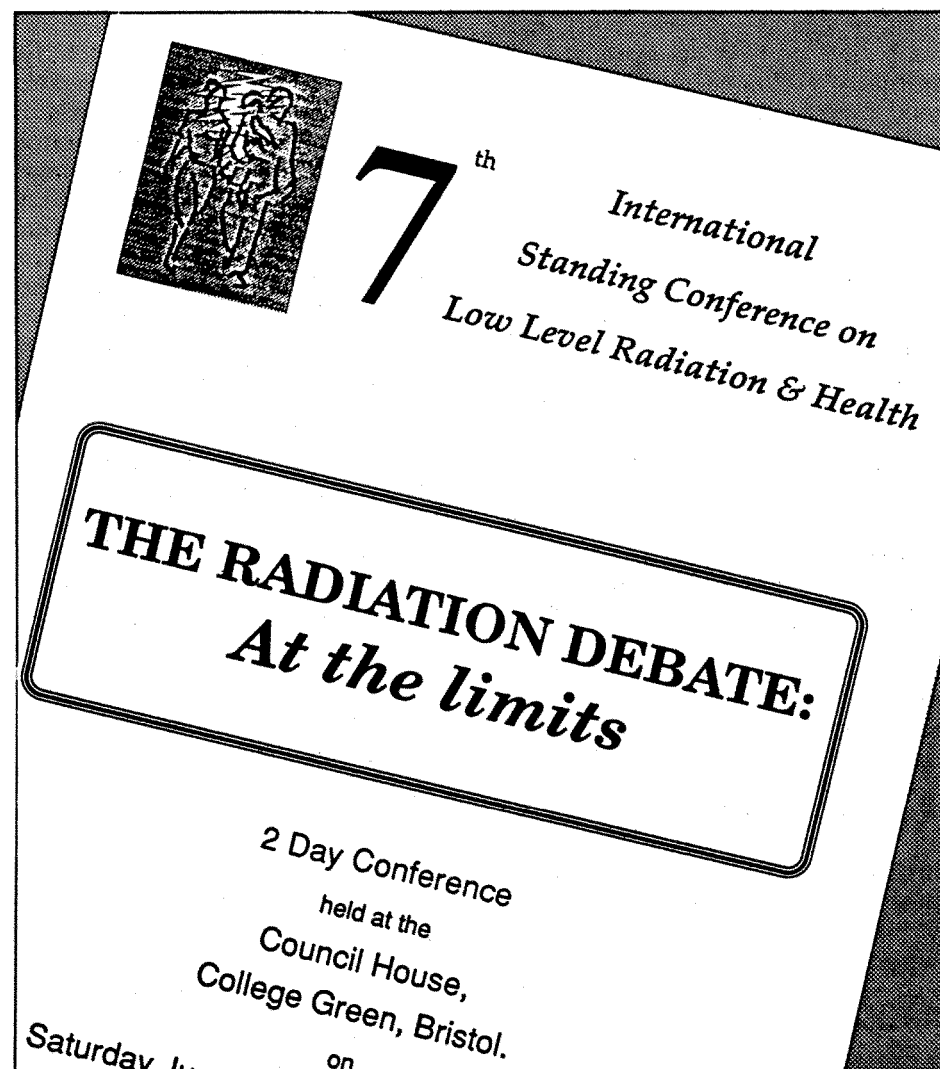
When it was pointed out that the FoE position is that a dose limit of 10 mSv for workers and 0.2 mSv for the public is the logical conclusion of the ICRP's own analysis of radiation risks Stather would not be drawn any further.

However, whatever the NRPB may ultimately decide may turn out to be irrelevant as the UK could be forced to adopt the new ICRP recommendations under European Law. Under the 1957 EURATOM Treaty, to which Britain is bound, signatories are required to establish uniform safety standards, which have always been based upon ICRP recommendations.

EURATOM has a dual role. Its principal task is to promote the development of nuclear energy. In addition, it is responsible for regulating the industry via the establishment of Basic Safety Standards. These are established through a EURATOM Directive which instructs EC member states to formulate national legislation which adopts the Basic Safety Standards.

The UK's 1985 Ionising Radiation Regulations were formulated in response to EURATOM Directives in 1980 and 1984, which in turn were based on the ICRP's 1977 recommendations.

The drafting of EURATOM Directives is left to the so-called Article-31 Group



of Experts, so-named after the article in the treaty that established the group.

In April this year, the European Commission finally agreed to release to FoE the names of the scientists serving on this group. For four months prior to this it had argued that because the scientists were 'experts' there was no need to release their names!. It even refused to release the scientists names to elected members of the European Parliament.

Several members of the Article-31 Group will be familiar to SCRAM readers. Dr Roger Clarke, the NRPB director is a member, as is John Dunster, former NRPB director. Both Clarke and Dunster are members of the ICRP. Dunster is widely acknowledged as being the principal architect behind ICRP moves to lessen the impact of the increased estimates of risk by arguing that it is the time at which you die from cancer that is important and not the risk of contracting it.

Another member of the Article-31 Group is Henri Jammet the Vice-Chair of ICRP. Jammet is employed by the French Atomic Energy Commission (AEC), the organisation that has argued that uranium mines would experience major economic difficulties if dose limits were drastically reduced (SCRAM 83).

A leaked AEC document contains their comments on the draft ICRP recommendations. It argues that the ICRP's proposed limit of 100mSv in five years would cause major problems for French uranium mines: "It must be realised that the limit of 100mSv over 5 years would have dramatic consequences for the operation of uranium workings. In the period between 1984 and 1988, 410 miners were exposed to radon, out of 1,276 who were monitored, ie 32%, exceeded the value of 100mSv. The same problem certainly exists in all countries throughout the world."

Nor is the problem unique to uranium mines. The same document said: "Certain activities, such as the fabrication of fuel, the maintenance of reactors, emergency action in the event of operating accidents and work associated with the dismantling of facilities result in exposure levels exceeding 100mSv in five years for small groups of individuals of high technical competence. It is estimated that there are some 1,500 persons who exceed the 20mSv per year threshold in French organisation as a whole."

A sub-group of Article-31 has been instructed to produce the new



Dennis Martin

EURATOM Treaty in draft form by the end of this year. So far, the European Commission has refused to say which members of Article-31 are involved in this. However, FoE has learnt that this sub-group is chaired by Jammet. Dunster and Clarke are also involved.

Political decision

At the end of the year, the draft Directive will be passed to the Atomic Questions Group; made up of EC member states permanent representatives to the Commission and senior civil servants. Its role is to ensure that the draft Directive is both "technically and politically" acceptable.

Towards the end of 1992 the Directive will be formally adopted by the Council of Ministers, at which time it becomes legally binding on member states. It is worth noting that the European Parliament appears to have no role in this process. A valid question, therefore, is whether the "need" to ensure the "political acceptability" of the Directive means that democracy is simply overlooked.

Although, the NRPB Director is on the drafting group his room for manoeuvre must be severely limited. It has been rumoured that Clarke wanted the ICRP to adopt more stringent limits than it did, but was over-ruled by the likes of Dunster and Jammet.

Consequently, whatever Roger Clarke and the NRPB may actually think about the ICRP recommendations, it seems likely that these will be adopted by EURATOM. The UK, therefore, will be forced, in a completely undemocratic manner, to adopt the new ICRP recommendations.

This must not be allowed to happen unopposed. The new ICRP recommendations are a blatant attempt to weaken the impact of the "international scientific consensus" that radiation is 4-5 times more dangerous than previously recognised. Not only must the role of the ICRP be questioned, but more importantly from a European perspective, the dual role of EURATOM and the undemocratic manner in which its Directives are produced and adopted must be challenged. □

Spurned in the west, the nuclear industry is turning its attention on eastern europe. Starved of consumer durables for decades and reeling under the effects of archaic, heavily polluting energy industries, the eastern europeans may well be too vulnerable to resist the nuclear industry's wily charms. Mary Beth Christie⁽¹⁾, Nada Kronjatanic⁽²⁾ and Zsusa Foltanyi⁽³⁾ set the scene.

Nuclear lure for Eastern Europe

A year ago, Prague shops rarely sold bananas; now, they sell them wrapped in plastic. A year ago, it was impossible to buy a computer or a telephone-answering machine; now, they are sold in every third shop in the city's main square, Wenceslas Square. A year ago, Czechoslovakia did not know the meaning of advertising; now, it is littered with billboards.

Many environmentalists are cringing as they watch their country speed down the road of development. Modern pre-packaged products are putting a greater strain on an environment already despoiled by coal fumes and dumped chemicals.

Fax-totting Western companies are promising jobs and prosperity, if the country gets more phone lines, more electrical outlets, more lights and more housing. Satisfying these demands requires more energy. The Government's answer is to build more nuclear power plants, to complete (perhaps) the Gabčíkovo dam across the Danube, and to build more connections with German and Austrian oil pipelines.

"As far as energy production is concerned, the best alternative for us is to use more nuclear power stations. The least acceptable is to use coal power stations", argues Czechoslovak Prime Minister Marion Calfa. "Whatever you burn in these stations goes right into the atmosphere. They don't have filters and that is why we have shut down a large number of these plants. So for us, the only clean energy is these nuclear power stations."

Hydropower

Calfa and others rule out hydropower as a substantial source of electricity because Czechoslovakia does not have enough rivers. At most, says one expert, 30% of the country's electricity could come from hydro, but that would require a lot of dams.

While environmentalists generally agree that coal burning is out – the brown coal that is strip-mined in Czechoslovakia has ravaged parts of northern Bohemia because of its high sulphur dioxide content – they argue for more creative solutions, like using power-saving

lightbulbs and refrigerators and other energy efficiency measures.

The Soviet Union, Czechoslovakia and the other former Soviet Bloc countries use 50-100% more energy than the US to produce US\$1 of domestic product, and 100-300% more than Japan.

Jaroslav Marousek from the Energy Efficiency Centre, a non-government group devoted to promoting energy efficiency, says the country need not expand its energy production capacity for five years if it used its resources wisely.

In the latest draft of the Czechoslovakia Energy Policy, the Government endorsed reducing consumption of oil, gas and coal. But it also promoted nuclear as the energy of the future.

The problem is that it will take a lot of money to re-tool factories with efficient machinery, to install thermostats and insulation in homes and apartment buildings, and scrap the huge coal power plants that pump heat into surrounding homes and offices. Part of that money would come from Western sources, who in general are not eager to participate in bit-by-bit projects.

Easy option

It is easier and quicker to build a billion dollar nuclear plant, which is concentrated in the hands of a few, than it is to turn an old power-guzzling structures into energy efficient ones.

"You have an entire industry developed to sell kilowatt hours – in simple terms, to sell a product to make money," says David Hunter, an American environmental lawyer who advises the Czechoslovak Government. "The trick is to put into competition technology that doesn't produce anything but which saves energy. But there will be no international lobby selling that idea because in the short term you can't make money on it."

Westinghouse, which has not sold a nuclear reactor in the US for over 15 years, is aggressively lobbying to win the contract for a new nuclear plant in Czechoslovakia. The temptation to go for a billion dollar deal with an US company that offers more up-to-date equipment than the previous nuclear power plant

builder, the Soviet Union, is enormous.

"We don't want to admit that the Western model of development is not good for us," says Juraj Zamkovsky, advisor on environmental policy for Public Against Violence, one of the governing parties in Czechoslovakia's eastern republic of Slovakia. "It's painful to admit this, but I think we need to re-evaluate our values, our priorities. We need to set limits for ourselves."

Setting limits is a treacherous idea in a country with 15 million hungry new consumers who are eagerly buying things that were not available to them before. After so many years of repression, they do not want to ration again.

A false sense of security

Yugoslavia is in a quandary over nuclear policy. At the centre of debate is what to do with the 632MW Krsko nuclear power plant (NEK). The Greens of Slovenia (ZS), who constitute 9% of the new anti-communist coalition Government of this northwest Yugoslav republic, are strongly anti-nuclear and are all-for dismantling the plant, primarily because they consider it unsafe. They argue that the risk is disproportionately high for a small economy (GNP US\$11.2 billion) of just 2 million people, especially since the plant is situated in the most earthquake-prone part of Slovenia. They also say they have no right to bequeath a dangerous legacy of radioactive waste to future generations.

After Chernobyl, their fears cannot be dismissed as irrational, argues Green party activist Nezha Excel. The region could simply not cope with a disaster on that scale, Excel says.

The ZS claim to represent a "realist" rather than a "fundamentalist" wing of the broader green movement in Slovenia. Their pragmatism is also the price they pay for being in power. "We can't demonstrate against the policies of a government we are part of", explains Aleksandra Pretnar, a ZS parliamentary deputy.

Supporters of the plant agree that nuclear energy is cleaner than its alternatives, and pollution is running riot in Slovenia, one of Europe's richest



woodland areas. The republic disgorges an estimated 200,000 tonnes of sulphuric acid every year, most of it from thermal power plants burning lightweight domestic coal.

Pro-nuclear campaigners also say Greens have chosen to ignore a parliamentary review of NEK's design operational safety in eight years of commercial operation. It concluded that there was no cause for concern, and that NEK's performance was above average compared with nuclear plants in general and with Westinghouse plants of its own class in particular.

Excel argues that the review is lulling Slovenia into a false sense of security. The plant may be completely different to Chernobyl, and may have been built to stringent US safety standards, but pressurised water reactors are not inherently safe and so constitute an excessive risk, adds Excel.

Energy strategy

The most censured energy sources, coal and nuclear power, make up the bulk of Slovenia's power supply. The Government acknowledges that coming to grips with both will need careful coordination and planning. At present, Slovenia has a small surplus of electricity and is a net exporter. Demand is expected to fall, however, as free market and domestic reforms take their inevitable toll. This gives some leeway for restructuring resources but will hardly allow for the complete dismantling of one crucial source.

Energy Secretary Miha Tomschich is presently designing a 30-year energy strategy that he hopes will meet all the Government's goals, "including the overriding concern of market reform and privatisation of the energy sector, with as little disruption to energy supplies as possible."

Tomschich has also helped developed two alternative energy restructuring programmes - one keeping NEK open, the other closing the plant by 1995. Both contemplate vigorous conservation of energy in industry and increased use of cleaner and more efficient energy sources, particularly natural gas. Both suggest installing scrubbers and filters on all coal fired plants by 1995. Over 30 years, energy efficiency improves by 40% in both cases and the costs are similar, but closing down NEK is 60% more expensive in the short term.

At a time when money is short due to economic restructuring, the high costs of shutting down NEK may finally tip the balance in favour of those who want nuclear power. The fact that neighbouring Croatia - which half owns NEK - wants to retain it and is even considering installing new nuclear power plants is also strengthening the hand of NEK supporters.

To build or not to build

Hungary is less polluted than its neighbours, but more dependent on imported energy. So, it is little wonder that reducing dependence on the Soviet Union - source of 90% of energy imports - takes pride of place in the Government's unfinished energy plan. But independent experts and environmentalists say the draft plan fails to address adequately other, more fundamental issues: energy efficiency, assessment of future needs, renewable energy and the nuclear question.

The plan acknowledges energy efficiency but does not explain what savings are possible, nor proposes measures to achieve them. Yet this is a vital question in a country where each unit of energy produces 75% less goods than in Western Europe. Measures to improve efficiency and reduce consumption, including price rises, have had little impact. Equally important is the question of where the new energy will come from. Hungary has small deposits of low value brown coal and lignite, enough petroleum and natural gas for a quarter and half respectively of present annual consumption, and some uranium.

Another priority for the Government is the development of new and replacement generating capacity. Flexibility is needed, with smaller combined cycle units and dual-function plants producing both heat and electricity. But whether smaller units win the day will depend on the energy industry.

One controversial proposal is to increase plant capacity by 1,000MW by the end of the century. There are two possibilities - coal-fired using national

lignite or imported coal, or nuclear.

These options have been put out to tender abroad. The Hungarian Parliament is already considering proposals from several companies including Electricity de France (EdF), Westinghouse, Ontario Hydro, Siemens KWU, and apparently also some Soviet nuclear plant makers. The offers are shrouded in secrecy, but it appears that EdF, already operating the country's only nuclear plant of four 440MW units, is the front runner. EdF proposes to build two units of nearly 1,000MW capacity each. The company would advance 70% of the total finance, to be paid back in electricity over 15-20 years. In effect, this would mean that one of the units would be producing electricity for France or Hungary.

Environmentalists in Hungary are working to raise public awareness not so much of the immediate dangers of nuclear generation, but wider, long-term implications. They point out that if predictions of energy needs are initially set too high, energy intensive industries tend to be developed and protected as a result.

The green movement is also disappointed that the Government attaches so little importance to renewable energy sources which today provide 1-2% of Hungary's energy. The document predicts a rise to only 3-5%, but experts from the Hungarian Academy of Sciences say biomass such as crop residues and wood could cover 5-10% of needs.

Finally, the 'greens' feel that a political opportunity is being missed. Decentralisation was an important part of Hungary's political restructuring, and local governments were given new powers. Why should energy production not also be managed at local level?

The experience of other countries shows that firm Government action is needed to promote efficient energy use and to control the profit motivated growth of huge and unnecessary power generating plants. There is no sign yet that the Hungarian Government is ready to take such action. □

Notes:

(1) Mary Beth Christie, is a US journalist living in Prague, Czechoslovakia.

(2) Nada Kronja reports on energy issues from Ljubljana, the capital of Slovenia, Yugoslavia.

(3) Zsuzsa Foltanyi works for Panos Budapest, Hungary.

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Danube dam

FRUSTRATION is increasing over the massive Gabčíkovo-Nagymaros hydro-electric complex on the Danube (SCRAM 74) as the issue moves from a national to international context. Relations between Czechoslovakia and Hungary are becoming increasingly strained as the two eastern European countries try to reconcile the demands of their ailing economies with the those of the environment in energy policy.

One of Europe's largest single issue pressure groups, the Hungarian Duna Koer (Danube Circle) is largely responsible for the high degree of concern about the scheme. Together with other environmental groups, from Hungary and Czechoslovakia, they continue to be highly influential. Support among Hungarian MPs for the total dismantling of the dam, on environmental grounds, has risen to around 96%.

The Czechoslovakians, despite their own political revolution, on the other hand, have fought hard to get the Hungarians to adhere to commitments made in the 1977 intergovernmental treaty covering the project. They have declared that they are prepared to complete their end of the project by building a weir on the Slovak side, despite the Hungarian position.

The complex consists of nine schemes, all to a lesser or greater extent involving a 170 mile stretch of the Danube between Bratislava and Budapest. It is supposed to not only generate electricity but improve navigation. This would require the building of a giant reservoir and barrage at Nagymaros, north of Budapest.

Joint venture

Originally the plan was for joint construction by Czechoslovakia and Hungary, with Austrian financial assistance, for 2 dams - at Gabčíkovo (720MW producing 2,680bn kWh per annum) and Nagymaros (156MW producing 1,041bn kWh per annum). The former was to be completed in 1986 and the latter 1990, postponed under a 1983 treaty revision to 1990 and 1994 respectively.

Unilateral completion by Czechoslovakia is not without penalties. It will produce much less electricity than originally planned, and will involve 3.7bn koruna (nearly £70m) of additional costs. This they consider justifiable given that they have completed 80% of the work and in view of the international condemnation faces for both its reliance on high-sulphur content brown coal and its nuclear programme. 30% of Czechoslovakia's the trees have experienced irreparable acid damage and a further 50% are partially damaged.

Their keen pursuit of the nuclear option, now providing around 27% of the country's electricity needs, is meeting fierce opposition particularly from Austria. An international panel of nuclear

scientists, coordinated by Vienna University, has issued a report concluding that to continue operation of Czechoslovakia's oldest plant at Jaslovské Bohunice, less than 40 miles from Vienna, is to court disaster. The lack of an emergency cooling system for rupture of the primary circuit, the inadequate quality of some materials used and the fact that it is located within an earthquake zone are all cited in the report.

Closure call

The Austrian government has called for: the closure of Bohunice, suspension of the nuclear power development programme, offering in exchange desulphurisation technology and free electricity. The Czechoslovakians accuse the Austrians of overreacting and remain committed to keeping Bohunice in operation until 1995.

Both positions are becoming entrenched. The Czechoslovakians prefer to be 'up-beat' about benefits of the dam scheme claiming it will protect the area from flooding, stabilise water levels, provide a crucial shipping route between the Black and North seas and put several of the coal fired stations out of commission. It is also unhappy about the prospect of losing the equivalent of a quarter of the electricity output of Bohunice, or roughly

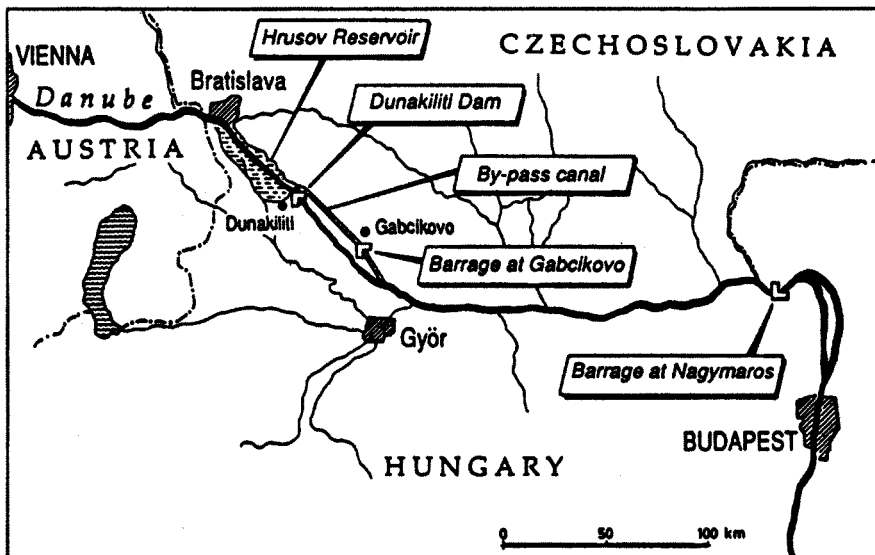
15% of its electricity consumption.

Hungary remains opposed on ecological, economic, and territorial grounds. It argues the dam scheme: threatens one of Europe's last tracts of primeval forest, the Danube and other Czech rivers flow slowly and will therefore yield paltry levels of electricity, the diversion of the river would force re-delineation of the frontier, infringing the integrity of Hungarian territory. Counter proposals by opponents include a conservation park and cooperation on a gas turbine powered station.

The first non-communist government in Budapest made concessions difficult by refusing compensation to Czechoslovakia. Now it is adhering to its ecological principles and wants treaty abrogation, structures demolished, costing Kr 18bn, and the site returned to original state. A status quo option would cost Kr 2.2bn plus Kr 500m a year there after.

Negotiations earlier this month broke down. Czechoslovakia proposed the European Community as mediator, however, the Hungarians objected to the inclusion of completing the dam as an option in the proposal.

Negotiations will resume in the Autumn. Clearly a package from the EC, with financial and other assistance for renewable options, is vital to resolve this issue. □



Proto hydro

A prototype mini-hydro electric system intended for the Third World is bringing benefits to an isolated farmhouse at Fountains Fell in the Yorkshire Dales.

The scheme, bringing together the National Trust, Nottingham Polytechnic and Intermediate Technology (IT) makes use of the areas 1.5 metres of rainfall a year to drive the device producing a maximum of 4kW. For the first time providing the farm with round-the-clock electricity and enabling the mothballing of a noisy and expensive diesel generator. It is also being

tested at two other sites, one in Derbyshire and one in Devon.

By using a conventional pump in place of a turbine the system is easily transferable to Third World countries. Adam Harvey of IT comments: "It is designed for production and maintenance by the communities where they are actually used."

Although the proto-type system costs £6000 to install without labour this will drop when development is complete and it goes into production. However, in deriving electricity from the free-flowing water at negligible cost and with a life span of at least 10 years - probably 30 years - it is still expected to pay its way. □

Wind under scrutiny

A decision is due shortly on the Cemaes, Dyfi Valley, wind farm following a Public Inquiry which brought different environmental groups into contention. A conflict created largely by the imposition of arbitrary constraints under the Non Fossil Fuel Obligation.

The proposals, for a wind farm of 24 2-bladed wind turbine generators, have been put forward by the Wind Energy Group (Taylor Woodrow and British Aerospace) and Dulas Engineering; with the backing of Llanbrynmair Community Council, Montgomery District Council and Powys County Council; many local individuals; and groups such as the Ramblers Association!

Objections were lodged by the Countryside Commission, the Snowdonia Park Society and the Council for the Protection of Rural Wales (CPRW). The CPRW went to great lengths to emphasise their 'anti-nuclear/pro-renewable energy' policy but the local branch committee, concerned about the visual intrusion of

the farm from the vantage points of the near-by National Park around Cader Idris, felt it necessary to oppose the application. They also expressed concern about the lack of a national policy supporting renewable energy projects.

The thorny issue of visual pollution was dispelled by photomontages prepared by Dulas, exposing the insignificance of aerogenerators at over 5 and 10km.

The proposers also derived strong backing from FoE Cymru who argued that wind farms gave rise to unwarranted fears of 'the strange and unusual' precisely because the UK has failed to embark on wind farm projects. This contrasts with experience in other European countries where such developments enjoyed considerable local support, according to FoE.

They pointed out the serious nature of both existing visible intrusions, such as the high levels of traffic, as well as the invisible intrusions from emissions of sulphur dioxide and radioactivity that continued to severely affect the region. Over 400 farms in Wales still face restrictions on the movement and sale of sheep since Chernobyl.

FoE Cymru also emphasised that such a site could always be returned to a 'genuine'

greenfield site and the importance of an inquiry for wind farms at this time.

The final decision over the Cemaes wind farm lies with Welsh Secretary, David Hunt.

There is a danger of the conflict between environmentalists, setting visual intrusion against the urgent need for renewables development, diverting attention from the underlying issue.

It would be far better to concentrate on real changes that would promote renewables. Of primary concern is the relationship between wind speed and designated areas of the countryside, such as National Parks. The financial pressures imposed by the 1998 contract cut-off date under the NFFO, which forces developers to opt for the windiest sites, ie with wind speeds greater than 7.5 metres per second, or, to put it another way, areas that predominantly lie in or in close proximity to designated areas. This is only 18% of the land mass, 10% of which, with wind speeds over 8.5m/s, is designated. If restraints were eased to favour use of wind speeds between 6.5 and 7.5m/s, 30% of the UK land mass would be made available - the percentage of exploitable wind energy in England and Wales would then rise from 36% to 74%. □

Wind delay

WIND farm proposals at Ovenden Moor, near Halifax, are facing an Inquiry in spite of the fact that there are no objectors!

The District Council gave its approval for the scheme in March of this year. However, it was not until June 25 that Environment Secretary, Michael Heseltine, took the unusual step of 'calling-in' the proposal, in the absence of objectors, for a Public Inquiry.

Yorkshire Water, who are behind the project, have explained their plans to the local community and to amenity groups, gaining their support. However, Heseltine wants further information on 5 points: the acceptability of the proposed development having regard to the Government's planning guidance on renewable energy; its appropriateness in relation to the Calderdale Green Belt; its effect on visual amenity in an area designated 'special landscape area'; its suitability taking into account other potential sites in the South Pennines area; and its effect on flora, fauna, noise and local traffic.

This Inquiry will make further inroads into the severely restricted timetable. □

Shetland wave

PLANS are being laid to harness wave power on the west coast of Shetland, by Ocean Power Ltd, a group comprised of Acer Consultants (Britain), Volker Stevin (Netherlands), the multinational Asea Brown Boveri and Norwave.

Shetland Island Council's development committee have agreed to provide up to £5000 or 50% of the feasibility research. The money will go towards surveying sites suitable for tapered channel (Tapchan) wave plant (SCRAM 83).

Proposals must be submitted to the European Commission by October to be eligible for grants under the Thermie Initiative (SCRAM 82).

While approving preliminary finance, reservations were expressed by Shetland Island Council about the validity of the venture owing to the paltry amounts paid by the privatised utilities to new independent power generators. As new schemes they will not be eligible for the special 5.3p/kWh rate offered by the Utilities to existing independents. □

Duck hunt

STEPHEN SALTER, designer of the eponymous Duck, has been invited to apply to the European Commission for a £70,000 grant for an offshore wave power programme, the first since the controversial shut down of the UK programme in 1982.

The money is part of £800,000 on offer to European wave specialists from the ECs renewable energy division. It will go towards studying power conversion in various devices, including a high pressure oil design proposed for the Duck.

It is hoped that the EC money will create opportunities for the establishment of one offshore device and increased funding in the future. □

Icelandic imports

PLANS to export cheap Icelandic geothermal and hydro-electric power are once more being touted (SCRAM 81). The French group, Alcatel Cables is proposing a 500MW connector from east Iceland to Dounreay via a booster station on the Faroe Islands.

Alcatel are involved with the Channel link for transmission of electricity between France and England.

The advantages used to promote the scheme, this time, are security of supply following the Gulf War and that by the year 2000, power could be supplied as cheaply as 2p/kWh. □

WIND INITIATIVE

Renewable energy enthusiasts have set up a company to make community windpower a reality in the UK. They hope to replicate the successful experiences in the Netherlands and Denmark.

Lagerway 80kW machines, at 30m in height and with 18m blades, are described as being reliable and efficient with a low noise rating and are widely in use in the Netherlands. Initial efforts are being focussed on finding windy areas near 11kV 3-phase transformers (a metal box $\frac{2}{3}$ the way up a pole with 3 ears sticking out and 3 wires going in on the supply side).

In the Netherlands connection to these points is free of charge but the costs here are yet to be established. Hence the group would be particularly interested in hearing from anyone with knowledge of the law in this area. Anyone who would like further information should contact Dave Toke at 215 Hubert Road, Selly Oak, Birmingham B29 6ES or telephone 021 472 8095.

Coal at the crossroads

URGENT action must be taken by Government to prevent the imminent collapse of the UK's coal industry and the threat posed to the nation's security of supply by heavy reliance on imports, warns the strongly worded Clean Coal Report* from the Energy Select Committee.

The Tory controlled committee also unanimously challenged the Government to develop a national energy strategy.

It is feared that UK coal production could fall from the present 70m tonnes a year to around 50m tonnes as generators resort to cheaper, low-sulphur imports – most of the UK's low-sulphur coal mines have been closed in recent years. This would reduce the UK industry to a handful of pits by the end of the century.

This takes no account of developments that make coal more environmentally acceptable and efficient, emitting far less sulphur dioxide and carbon dioxide per unit of electricity generated.

The Report comes at a time when industry is suffering low morale after a decade of closures and with the uncertainties of a privatisation to look forward to. Threats loom as contracts with the electricity generating companies expire in 1993 and National Power (NP) and PowerGen switch to imported coal. This is highlighted in NP's recent announcement of a £5m investment in

coal handling facilities at Hull.

The Committee is anxious Government should recognise the benefits of clean-coal electricity generation and called for it to adopt a long term perspective, warning against easy cuts today when later expansion would be both expensive and difficult. The Committee recommends:

- investing substantially more in clean coal research. While it cannot compete with gas or imported coal at present, note the Committee, developments could change this;
- Government support at least matching that of other governments to their coal industries.

The report argues that the current cheapness of gas-fired generation and the lack of UK demonstration clean-coal projects creates a climate in which Government support is vital. Of the latter it states "without government assistance ... the UK's R&D in this field will have been largely futile".

It is also critical of the Department of Energy whose actions are inconsistent with the importance it claims to attach to clean coal technology. A long-term strategy for the Department would require:

- a realistic appraisal of the extent which industry can be expected to provide the necessary funds;
- a new emphasis on demonstration projects, and therefore an increase in funding;
- a new sense of urgency, recognising

that the UK's competitors are making progress in the expectation of significant export markets.

One common area between Energy Secretary, John Wakeham and the Committee did emerge in the form of the rarely used 'security of supply' argument as the main reason to preserve the UK coal industry. Tory Committee Chair, Dr Michael Clark, said: "We'd rather have security of supply from our own little island than from anywhere else."

At the recent Union of Democratic Miners annual conference Wakeham said, British Coal could offer "generators the security of fuel source priced in sterling, which is not subject to the expense and uncertainty of transporting coal half-way around the world ... there is an undoubted value to National Power and PowerGen having a secure source of supply on their own doorstep." □

* Clean Coal Technology and the Coal Market After 1993, Energy Committee 5th Report. HMSO, 1991.



Acid research axed

NATIONAL POWER (NP) has all but relinquished its responsibilities inherited from the CEBG for research into acid rain. 90% of the research staff at its Leatherhead laboratory are to be made redundant in a cost cutting exercise.

This sacking of 450 scientists, shows the emphasis placed on the environment by the privatised boards. The move is in stark contrast with the announcement of a £50,000 pay rise for their Chief Executive, John Baker.

In a letter to Rhodri Morgan MP, a Labour Party energy spokesman, Baker washed his hands of any non-commercial research projects that were in the national interest. He said, NP will not sustain "research programmes which were addressed to the solution of national or international issues where these extended far beyond the bounds of our own company interests."

The research unit was the largest of its kind in Britain and in recent years had unlocked many of the secrets of acid deposition, in particular with regard to leaching and replenishment of chemicals in soil and their impact on plants.

The unit is no longer required, according to Peter Chester, NP's research director, with the recent changes to Her Majesty's Inspectorate of Pollution introducing controls on power station emissions in line with the rest of Europe. □

From grey to green

IN response to criticism by environmentalists that the Government has let the environment slip down the agenda, John Major gave his first green speech early in July, producing the green veneer for a Tory manifesto.

Mirroring Labour and Liberal Democrat policy, he announced the formation of a new Environment Agency from the merger of the National Rivers Authority (NRA), Her Majesty's Inspectorate of Pollution (HMIP) and the Drinking Water Inspectorate.

HMIP's budget is presently £450m with 6,500 staff and is itself the result of a merger between inspectorates for air, land and water. NRA has a £24m budget and 250 staff.

However, specifics concerning organisation and funding for the new agency were not forthcoming and await the next Parliament, emphasising underlining the Governments 'wait-and-see' approach to environmental protection.

Speaking at the *Sunday Times* Environment, Wildlife and Conservation Exhibition in London, Major followed his predecessor in emphasising the role of the market, and cited an estimated £140 billion market in environmental goods and services in Britain over 9 years. He made no commitments to government interference in the market to encourage energy efficiency, relying instead on exhortation. □

Irish wind threat

CAPE Clear Island's 4 year old advanced wind energy system will almost certainly close if the Irish Government and Electricity Supply Board (ESB) do not continue funding warns the newly formed Muilte Gaoithe Chleire Action Group*, writes Michael O'Donnchu.

The system was a Commission of the European Communities (CEC) project designed to demonstrate the feasibility and economy of Wind/Diesel/Battery sets in remote areas. Funded by the CEC, the German Federal Ministry for Science and Technology, the Irish Department of Energy, and the manufacturers MAN Technology and SMA Regelsysteme, it was meant to replace the costly, unreliable and environmentally undesirable twin diesel generators which have been supplying Cape Clear Island with electricity since 1971. The project, at a total cost of DM 1,454,500, began on January 1 1985 and ended on May 31 1988.

The system comprises of two Aeroman 30kW wind energy converters (WEC's), a diesel generator set of 72kW, a 100 kWh battery storage system and a computerised control system. Over an initial measurement period of one year, it showed significant advantages over the conventional twin diesel plant by supplying about 70% of the total electricity demand. The running time of the twin

diesel generators was reduced to one third, prolonging their life, and an annual saving of nearly 100 tonnes of diesel with a corresponding reduction in pollution.

However, the system has been a victim of the islands popularity - the main industry and income of the islanders is tourism; hence peak load occurs in the summer. Since the wind energy system was installed, increased demand has risen with increased tourism. Consequently the system cannot cope during periods of low wind speed and high electricity demand and the island has to resort to using the wind energy converters in parallel with the old diesel generators.

The islanders are extremely disappointed with the Irish Government and the ESB who want to scrap the wind energy system in favour of an electricity supply via submarine cable from the mainland. Whilst many governments around the world are looking to renewable energy systems - with their minimal environmental impact - to meet an increasing proportion of their energy needs, the Cape Clear Islanders believe that the Irish Government has little interest in this issue.

In an open letter to Robert Molloy, the Irish Minister for Energy the Group writes: "We Islanders realise that ultimately the real issue at stake is the challenge posed by wind energy to the existing monopoly of the ESB. Wind energy by its nature implies the decentralisation of power generation. There is enormous potential for rural development

and employment, for protecting the environment and for tourism."

The owners of the wind energy system, SMA Regelsysteme, would like to continue to produce electricity on the island and have plans for further development of the system. The modifications would cost significantly less than connecting the island to the mainland grid and will require the installation of a larger diesel generator. SMA Regelsysteme will require finance for this development but the Irish Government and the ESB have refused to fund any further development.

If funding to upgrade the system cannot be found, SMA Regelsysteme will remove the battery bank, control system and diesel generator.

The Islanders fear that this will be the first step in the eventual removal of the wind turbines. The island Comharchumann (Cooperative) at a public meeting on 20 June 1991 voted unanimously to continue the project and have formed the 'Muilte Gaoithe Chleire (Cape Clear Island Windmill) Action Group.' They are determined to save their wind energy system and intend to fight the issue both in Ireland and if necessary in Brussels. □

* Those wishing to support this scheme can obtain further information and petition forms etc from Michael O'Donnchu, Muilte Gaoithe Chleire Action Group, Cape Clear Co-op, Skibbereen, Co. Cork, Eire.

Sardinian renewables

SARDINIA could become an exporter of renewable energy instead of an importer of conventional energy by 2005, according to plans drawn up by Virginio Bettini MEP. A phased transition to renewables would also have a positive effect on the environment and provide a valuable water desalination resource.

The initial transition phase would make use of coal gasification, leading to significant reductions in CO₂, utilising the extensive Sulcis coal reserves. It is also proposed to connect the gasification plant to the mainland Italian/European methane gas network. The second phase seeks to develop renewables. Along with wind power and biomass, there are interesting proposals for deriving energy from local tides and extensive use of hydrogen gas as a carrier fuel.

Although the Mediterranean does not usually offer an ideal environment for wave energy, the Strait of Bonifacio between Sardinia and Corsica is proposed for renewable development because it boasts a race of about 5 knots. It is estimated that Voith turbines, at 24 hour continuous generation could produce around 5 billion kWh/yr - about 2.5% of the electricity produced annually in Italy. Linked to desalination plants, fresh water can be produced at competitive prices.

Sardinia receives a similar amount of radiant energy as Saudi Arabia, where a prototype 350kW photovoltaic system would produce an estimated 170,000m³ of hydrogen gas a year. □

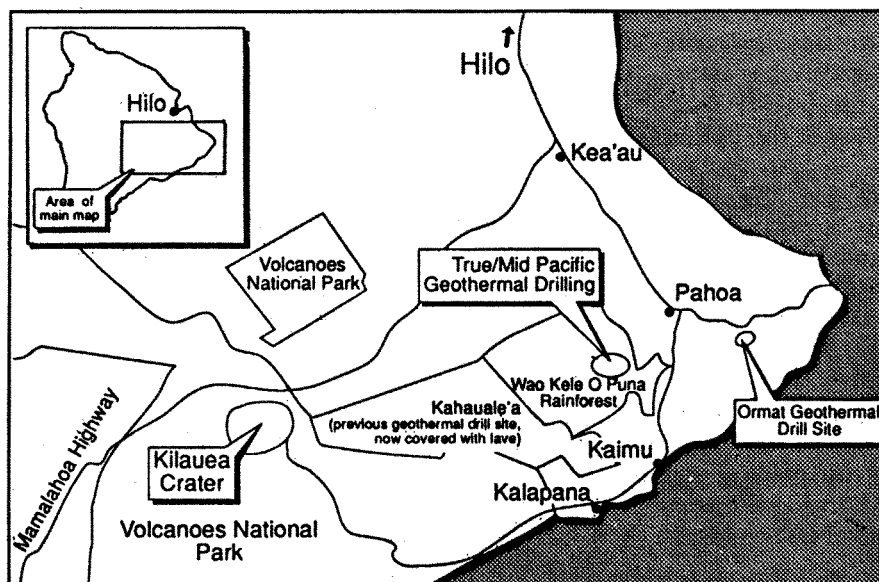
Hawaii blowout

A major uncontrolled release of steam, lasting 31 hours, has jeopardised the geothermal programme on Big Island in Hawaii. The blowout occurred in the vicinity of the island's active volcano, a fact which was seized upon by several geothermal energy opposition groups.

The drilling company, Puna Geothermal Venture, hit a pocket of high pressure steam at 3,500 feet below the surface, approximately half the depth the

company expected. This they have interpreted as being an indication of how much greater and easier the power is to obtain than anticipated. They hope this well could supply 10MW of a 25MW plant for Big Island.

Opposition to geothermal power on the Island has been growing for some time. The Rainforest Action Group, the Pele Defense Fund and the Pacific Science Congress have all come out against the project on safety grounds and threats posed to biodiversity and rare species in the adjacent rainforest. □



REVIEWS

Energy Without End; by Michael Flood.

Friends of the Earth; 1991, 75pp, £6.95 or £5.50*.

Michael Flood outlines a viable energy strategy by which Britain could meet one fifth or more of its energy needs from renewables. The Government has chosen to ignore this case since the first edition, five years ago, but increasing awareness of global environmental impact has sharpened the arguments for renewables. Of necessity therefore Flood takes a more radical approach, arguing to cut dependence on fossil fuels by half through a combination of energy efficiency measures and renewables energy technologies.

Whilst looking at the feasibility of the range of renewables, the book focuses on the policy issues rather than

technology and manages to present the information in an accessible manner.

The book appears well suited to upper school age and it is good to find that educationalists can obtain a reduction through the School Friends Club. If there is a gripe it is with the quality of the tables which suffer from restricted use of colour and will need some reinterpretation in the classroom situation. On the plus side, the layout is excellent and for once, the photographs of renewable technologies are visually exciting.

DAVE SPENCE

* School Friends Club rate, contact John Howson, Education Officer for details.

Radiation Risks (3rd Edition); by David Sumner, Tom Wheldon and Walter Watson.

Tarragon Press; 1991, 236pp, £9.95.

Many books have been written about the risks of exposure to ionising radiation, but none are as readable as *Radiation Risks* by David Sumner, which is now in its third edition. The book, which is now co-authored by Tom Wheldon and Walter Watson, a medical physicist, is presented as an "elementary and balanced guide to the possible health hazards of low-level radiation".

The book starts with a very readable introduction into the basic physics and biology of radiation, which anyone who wants a straight forward guide to

the jargon frequently used by the 'experts' would be well advised to read. These introductory chapters are followed by chapters on estimating the magnitude of radiation risk, formulation of safety standards, leukaemia clusters and radiation accidents.

Throughout, Sumner really does manage to demystify the science and present it in a manner which people can read and understand. This book is to be highly recommended to anyone wanting a general introductory text to the radiation debate.

PAD GREEN

Energy Policies and the Greenhouse Effect Volume One: Policy Appraisal; by Michael Grubb.

The Royal Institute of International Affairs,
Dartmouth; 1990, 294pp, £16.99.

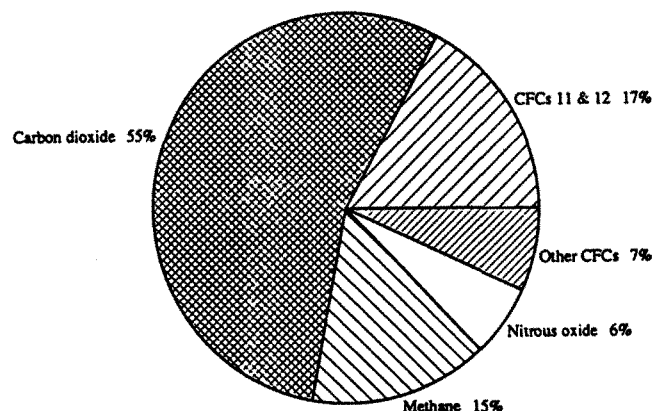
The run-up to the UN Conference in 1992 will see many governments struggling with the array of policy measures in their attempts to appear proactive in the face of increasing awareness of greenhouse issues. In this one book, Grubb covers most of the options available.

He considers the merits and limits of policy instruments such as abatement policies, their viability, costs and impacts, and the interrelationships between them with commendable clarity. As such this book is well suited to those who find energy pricing and subsidies and the macro-economics of carbon taxes a bit dull.

Grubb locates energy at the heart of the greenhouse problems but moves to get at the key issues of political and institutional constraints. Here there is plenty of scope for argument. He recognises the importance of the 'polluter pays' principle at an international level and of the developing world 'tunnelling' through to energy efficiency technologies.

As an academic however, he puts all sides of the argument, resulting in serious reservations about the realisation of such solutions.

The second volume, Country Studies and Technical Options, will cover the reduction of carbon



The contribution from tropospheric ozone may also be significant, but cannot be quantified at present.

Source: J.T.Houghton, G.J.Jenkins and J.J.Ephraums (eds), *Climate Change: The IPCC Scientific Assessment*, Cambridge University Press, Cambridge, 1990.

emissions from Britain, Japan, US, USSR China and India. Unfortunately there will be little chance of it containing an index for both volumes from which a wide-ranging book of this nature would have

benefited.

This aside, many readers will enjoy the concise coverage of difficult topics that are frequently glossed over in other texts.

DAVE SPENCE

REVIEWS

Nuclear Decommissioning and Society: Public links to a New Technology; Edited by Martin J Pasqualetti.

Routledge; 1991, 256pp, £45.

Although the quality of the contributions to this book varies, some useful material has been assembled – particularly in relation to decommissioning finance and law – and the importance of the social implications of decommissioning has been successfully highlighted.

Fothergill and MacKerron, for example, guide the reader through the complexities of decommissioning costs, financing, and funding mechanisms. Their conclusions put the costs of decommissioning in perspective: “although these costs are substantial they do not in themselves demolish the case for nuclear power”. Rather, decommissioning should be seen as “an uncomfortable financial burden” which will lead the nuclear industry to “spend and do as little as possible while giving reassurance ... that everything is under control.”

But as becomes clear everything is not under control. In particular, the UK approach to funding decommissioning – where the ‘fund’ is left with the utility for reinvestment in its own business – is unsatisfactory to say the least. As

Fothergill and MacKerron forcefully point out: “The fact is that, despite the book entry there is no corresponding bank balance.” The result will be that the industry will borrow money at the time of decommissioning, thus placing the burden of financing mainly on later generations. The more acceptable alternative is to create a genuine fund, by handing over money to a third party for very low risk investment. The real accumulation of funds could then take place.

In his chapter on decommissioning and the law, Richard Macrory highlights that under the present legal framework there is a lack of opportunity for local authorities and other statutory bodies to participate in decision-making about the manner and timing of decommissioning. Macrory predicts that there will be a demand for additional legal mechanisms, or a clarification of essentially untested ones, to remedy the situation. This is certainly something that ‘Nuclear Free’ local authorities will want to look at.

Pasqualetti, the book’s editor, is right to argue that

there needs to be a more thorough consideration of the “social ties” to decommissioning – jobs, waste, economics, the law, public opinion, siting, land use, and legacies, to name the more obvious ones. This is particularly so now Nuclear Electric have officially announced a change of policy on decommissioning. The idea of removing all of its power stations in pieces to waste dumps has been put on the back burner. Instead, once the nuclear fuel has been removed, the company plans to mothball the power stations for over 130 years inside concrete and brick “safestores”. Decisions would then be made as to whether to dismantle or mound over the stations.

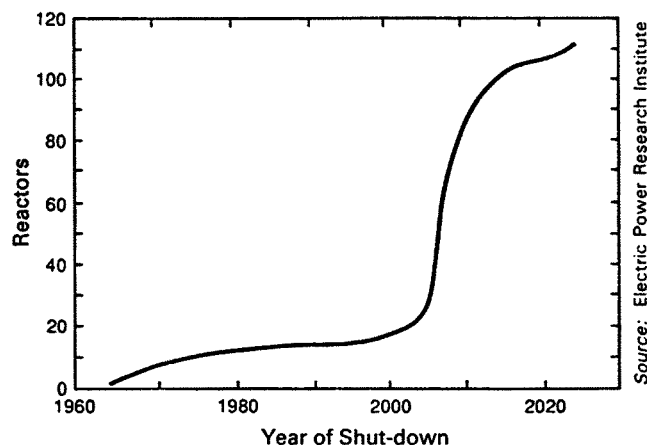
The industry would be well advised to heed Pasqualetti’s warning that “attempts to establish generic decom-

missioning policy will collide with a multitude of site-specific and plant-specific conditions.” Blowers suggests, for example, that a policy of “immediate” dismantlement could attract significant support at sites with single stations, on grounds of reduced public hazard, avoidance of surveillance requirements and blight; and because dismantlement reduces the geographical spread and political visibility of the industry.

This book introduces the range of policy issues that need thorough discussion – and not just by the industry. Perhaps most significantly it starts to construct the case for decommissioning decisions to be made on a site-by-site basis, with proper mechanisms for public involvement.

FRED BARKER

The coming rise of eligible plant retirements in the USA



LETTERS

Dear SCRAM

“Nuclear Power is not economic.” We seem to be getting complacent and horribly British about it. But, yes, there is a real world beyond the celebrated White Cliffs. Perhaps we should take a look.

For all that the Hinkley Inquiry showed was that nuclear power is not economic in British financial circumstances. But these circumstances are unique to

Britain. No other comparable state pursues them to the point of ideological insanity; and in those without indigenous energy resources, nuclear prospects look at least as good as anything does just now.

the disqualifying factors here are these: interest rates permanently higher than in comparable countries; unrestricted shareholder greed, especially in the new privatised monopolies; and a fat-cat City, which, without

protest, is allowed to write its own ticket with regard to feather bedding and avoids like the plague anything that looks remotely like risk-capital.

But these are the very factors which have destroyed all capital intensive investment, not merely nuclear – and are now busily destroying much else, such as home ownership; they are also the reason why British inventions go abroad for finance.

If money does not start to recirculate, very soon, as an essential service at bearable cost then we are done for. Looking on the bright side, I think it will happen. And, when it happens, nuclear will be back as an option.

the case against it remains what it has always been: safety, not economics. Let us concentrate on that – the more so since the two are in conflict.

DON ARNOTT

LITTLE BLACK RABBIT

Little Black Rabbit has further news of Nuclear Industry sponsorship; and things seem to be turning against this expensive PR exercise.

Nuclear Electric (NE) thought it a good idea to support the opening concert at the Cheltenham Festival this July. Unfortunately for NE, two of those invited to contribute to the concert were festival composer-in-residence, Sir Peter Maxwell Davies; and Robert Simpson, also specially featured at the festival. As members of Musicians Against Nuclear Arms, both felt that the proliferation of NE sponsorship was not for them.

Bristol Cathedral Choir's £250,000 deal with NE (LBR SCRAM 81 & 82) isn't going too smoothly either. Bristol Cathedral have let the side down by using the South Choir Aisle to stage an exhibition by Ukrainian children "who have suffered as a result of the Chernobyl nuclear disaster."



LBR was fascinated by the recent G7+1 summit. A week of talks featuring the 7 'leading capitalist nations', with a walk on part for President Gorbachev. 'The Magnificent Seven' and their out of place d'Artagnan managed to fit a discussion of the environment into their hectic schedule. The support for nuclear power can, perhaps, be explained by the extent of their deliberations. By LBR's stopwatch each nation's contribution lasted an average 1 minute 15 seconds.



Shortly before Nirex's decision to build their waste dump at Sellafield (maybe), those campaigning against its siting at Dounreay because of, amongst other reasons, the effect on tourism, came under attack from junior Scottish Minister Lord Strathclyde. "This is the kind of scaremongering tactic used by people opposed to any kind of progress" he rebuked.

But wait a minute, nuclear waste repositories, a threat to tourism; this is a line of argument LBR has heard before. Ah yes, at the Mullwharchar Inquiry in 1980, by the local MP, Ian Lang; now, of course, Secretary of State for Scotland and Lord Strathclyde's boss!

Perhaps chastened by the response to his "whingers" speech or by Lang, Strathclyde is now claiming the credit for Nirex's announcement of Sellafield as their first choice.



Islay's experimental wave power plant was officially turned on in July. The ceremony for the world's smallest wave power station was appropriately performed by Colin Moynihan - the world's smallest energy minister. Moynihan's speech praised this small step forward in British wave technology. Strangely there was no mention of the 1982 Wave Review - that massive step backwards.



Yet to be seized upon by the Nuclear Industry's publicity machine is news from, of all places, the world of chess. The 18 competitors in a Kiev chess tournament at the time of the Chernobyl accident, are not only fortunately all still well, but have shown remarkable improvements in their world rankings.

Neither the NRPB nor British Nuclear Fuels can offer any explanation, but the British Chess Federation Publicity Director, David Norwood, who recently launched a 'Challenge the Russians Appeal', offered the tongue-in-cheek comment "I shall propose an immediate move of our offices to Sellafield."



Paul Flynn, Labour MP for Newport Pagnell, has raised the issue of irradiated condoms. His concern is that Far East manufacturers vulcanise rubber by irradiation. Steven Durrell, a junior Health Minister, replying to a question from Flynn, reported that the Department had no evidence of risks.

LBR awaits the Nuclear Industry's marketing of 'oriental, radiation-zapped condoms, to add that extra tingle and a pre-glow to the afterglow'. However, in case their services are ever dispensed with, the Gardner Report would necessitate a Government Health warning on the packets.

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