

More Questions
over Hinkley

Nirex Credibility
on the Rocks

Wind Farms
Seeds Sown



Dungeness

Nuclear Waste Scandal

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Views expressed in articles appearing in this Journal are not necessarily those of SCRAM.

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Comment

As the philosophy of 'dilute and disperse' is being abandoned in favour of containment, and as the public debate over nuclear waste policy continues, the CECB have taken the unilateral decision to discharge a new waste stream into the sea. This runs contrary to current thinking on the subject. A new plant at Dungeness A magnox station in Kent is soon to begin dissolving a backlog of 60 tonnes of intermediate level radioactive waste and will discharge the filtered solution into the English Channel. No public inquiry was held, and no environmental impact assessment has been drawn up. If the experimental plant is successful the CECB want to install a similar process at other magnox stations.

The NII have not yet given the final go ahead - it can still be stopped. Contact your MP, write to your local newspaper; if you live near a magnox station alert your local council - they probably don't know that a 'magnox dissolution plant' could be built in their area. Demand a public inquiry. If this waste management approach is allowed the marine environment and our children's health may suffer.

At the end of May the public consultation process being carried out by Nirex officially ends. Comments on their plans for disposal of low and intermediate level radioactive wastes will be analysed, and a decision on which community has won the doubtful prize of a radioactive midden will be announced later this year.

Nirex must be a little concerned with the reception their ideas have received. Even previously pro-nuclear areas have refused to be their guinea pigs - the people have said no, and their elected representatives have had no option but to follow suit. Nobody wants nuclear waste.

The Nirex philosophy has come in for heavy criticism. Their belief in the ability of geology to contain long-lived radioactive wastes does not stand up to scrutiny - geologists admit that the research has only just started, not enough is known about groundwater movements deep underground; and nobody knows what effect the construction of the repository itself will have on the geology.

The solution is clear. Stop producing the waste. Phase out nuclear power and reprocessing; contain the waste in above ground stores; abolish Nirex and create a truly independent body to advise on waste policy; and institute an immediate and wide-ranging publicly-funded inquiry commission whose recommendations will be binding.

Questions Over Hinkley

New rules governing public inquiries into nuclear power stations were brought into effect in March. This was followed rapidly by Cecil Parkinson's announcement, on 21 March, of the 'terms of reference' and arrangements for the Hinkley Point C public inquiry. HUGH RICHARDS describes the tight timetable which has been set for objectors, and argues that the Government's privatisation programme will weigh heavily on the Inquiry's process.

The Department of Energy have devised a turgid and misleading circular which has been sent to all 11,000 objectors, inviting them to write in for a 'code of practice' and a registration form. This obstructive administrative procedure, clearly designed to deter as many people as possible from pursuing their objections, has no basis in Law.

All objectors are already registered. In order to pursue their objections individuals should inform the Secretary of State that they may wish to appear at the public inquiry, but their decision will be determined by the outcome of the pre-inquiry meetings. The Outline Statement of Case under rule 5(5) of the new rules may only be required of major objectors, but if individuals are asked for one, it should be as broad as possible.

INQUIRY ARRANGEMENTS TO BE DECIDED

The pre-inquiry meetings, scheduled for 1 June and 12 July, are to discuss the form and procedure of the Inquiry, and to determine administrative arrangements such as whether objectors should have funding, and the provision of a bus service to the inquiry from Bridgwater railway station (5 miles away). By 12 August, four weeks after the second pre-inquiry meeting, objectors wishing to give evidence at the Inquiry must submit their Statement of Case. This should describe the main contentions to be put forward, and should list the documents to be referred to. Again, it should be as broad as possible.

At the main hearing which starts on 4 October, and is expected to last a year, objectors may be allowed to cross-examine official witnesses, but only on matters contained in their Statement of Case. When it comes to giving evidence, it is likely under the new rules that the Inquiry Inspector will require that only a summary of the Proof of Evidence be read out. The Inspector may prevent the giving of evidence which he considers to be irrelevant, repetitious or



"contrary to the public interest."

Cecil Parkinson's announcement of the Terms of Reference ensures that privatisation will be central to the Inquiry. The first matter outlined in the announcement is the applicant's requirement for the power station (particularly in the light of Government policy as set out in the Parliamentary Answer given on 17 December 1987 and in the White Paper *Privatising Electricity*, in particular paragraphs 44-49).

PARKINSON'S LAWS!

As the applicants are the CEGB, and they aren't going to be around to build the plant, the contents of those brackets need some study. In his 17 December Answer, Parkinson made four basic points:

- There will be a need for considerable new generating capacity before the end of the century.
- There is an obvious need for diversity in the nation's power sources to which nuclear power can make a vital contribution.
- The government are satisfied that the PWR can provide nuclear energy safely.
- Without further nuclear stations, the nuclear component in our electricity

supplies will decline as the existing magnox stations are retired.

Paragraphs 44 -49 of the White Paper are entitled "Security of supply and the need for nuclear power." Three principles are outlined for a secure supply of electricity:

- Proper control of the generating and transmission systems, to ensure that power can be delivered where it is needed.
- Sufficient generating capacity to meet demand.
- Protection against interruptions in fuel supply.

The first of these "will be met by ensuring that the grid company retains central control of the transmission system and the power stations connected to it." (In other words the ability of a generating company to earn money is directly controlled by another company).

The distribution companies will "retain" a statutory obligation to supply, and will therefore have to place contracts for sufficient capacity to meet demand. This obligation is designed to meet the second condition.

THE 'POISONED CHALICE'

The third condition "is best achieved by using a number of fuels from which to generate electricity." There will be a statutory obligation on the distribution companies to contract for a yet to be specified minimum proportion of non fossil-fuelled generating capacity:

"Renewable sources of energy will play their part, but there remains a vital strategic need for the significant non-fossil-fuelled contribution that can only be made by nuclear power."

Free marketeers such as Alfred Sherman are unhappy about the obligation to buy nuclear generated electricity, calling it "the poisoned chalice."

The safety of the PWR will be considered, taking into account the conclusions of Sir Frank Layfield and the Nuclear Installations Inspec-

torate. One of Sir Frank's conclusions was that he was not able to base his conclusions on a final safety case for Sizewell B, as none was submitted (para 9.48).

SAFETY, HEALTH, WASTE MAY BE COVERED

The Hinkley Inquiry will be the first PWR inquiry at which it will be possible to examine the final pre-construction safety report (published on 21 December 1987) in public. It should therefore be possible for Friends of the Earth and COLA (the consortium of opposing local authorities) to take a more considered view of the dangers of the PWR than was possible at Sizewell, where the CEBG evidence kept changing and was added to.

On-site storage of spent fuel from Hinkley C, and radioactive discharges into the estuary, are to be considered. The on-site storage of spent PWR fuel for 18 years is a policy that has only recently been revealed by the CEBG. Although the health implications of accumulating radioactive contamination in the Severn Estuary are not specifically mentioned in the terms of reference, Sir Frank Layfield asked that the radiological consequences of Hinkley Point C should be considered.

Radioactive waste management, and disposal, are not specifically mentioned, but could be taken as part of the operation of the plant. Decommissioning, and emergency arrangements are mentioned amongst the local planning matters at the end of the terms of reference.

The conclusion of this brief look at the terms of reference is that it is worth us all attending the inquiry, and that prospective private investors will get a chance to decide for themselves whether to buy a PWR. The conduct of the Inquiry, under the new rules, will largely be determined by the Inspector's interpretation of the terms of reference. Michael Barnes QC, is relatively young, but is expected to toe the Government line. If he is to survive the battles ahead he will have to win the respect of a hostile and suspicious public.

HUGH RICHARDS is a member of the Welsh Anti-Nuclear Alliance (WANA)

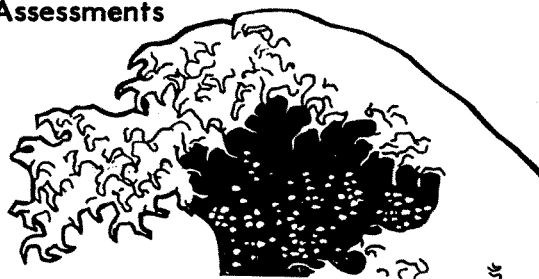
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Magnox safety

The Nuclear Installations Inspectorate have ordered the number one reactor at the ageing Bradwell magnox station to stay shut after its biennial overhaul.

The order comes just eight months after the NII completed their long term safety review of the station. The review demanded that the CEBG bring the station up to scratch and justify further operation on 17 key issues of safety.

The CEBG managed to meet the year-end deadline for most of the requirements. But the NII require further improvements, which they have identified as being "reasonably practicable", if extended operation to April 1992 is to be permitted. The number two reactor is still operating, but will not be allowed to continue beyond next April unless similar improvements are made.

One of the major changes is to "certain inspection arrangements." Speaking to the New Civil Engineer, NII inspector

Eddie Varney said that these include the inspection of key welds inside the reactor's steel pressure vessel, where the gas coolant ducts enter and leave.

Failure of the pressure vessel at this point could be catastrophic. John Large, an independent nuclear consultant, told SCRAM that a break in the upper duct, where the hot coolant leaves the vessel, would cause such a build up of pressure that the whole core would move.

Then, in what Large describes as a "very severe ignition scenario", the control rods would not be able to enter the core to shut down the nuclear reaction. Because of the movement, fuel rods could break and ignite, releasing fissile material into the atmosphere. This, comments Large, would be an "interesting phenomenon to watch, from a safe distance."

Examination of these welds, in the hostile environment of the irradiated core, will entail considerable cost for the CEBG. Special robots will have to be developed for the task,

at a cost which could run into millions of pounds. The Board have said "it would take some considerable time to give detailed consideration" to the requirements.

A spokesman for CND, who have been campaigning for the closure of Bradwell for two years, told SCRAM that the problems identified in the New Civil Engineer article were predicted last year in Sanity. "The CEBG rubbished our views at the time, but our stance has been vindicated by the NII."

CND claim the Italian Latina magnox reactor, which was shut for ostensibly political reasons, really closed because of similar problems to those being experienced at Bradwell.

Although each magnox reactor is different, there are twenty others in the UK with steel pressure vessels similar to those at Bradwell. The Long Term Safety Review for the oldest of these, at Berkeley in Gloucestershire, was published on 13 April. The conclusions of this report indicate that the weld problems will be a generic fault in all the older magnox reactors.

Low-flying aircraft

Recent "near misses" between low-flying military aircraft and nuclear power plants in West Germany have rekindled fears of nuclear catastrophe.

A French Mirage on NATO manoeuvres, said to be simulating an airstrike on Czechoslovakia, crashed less than a mile from the two Ohu reactors in Bavaria on 30 March. Military jets are forbidden from flying within two miles of nuclear installations.

The following day a US F16, also on NATO exercises, crashed seven miles from the Karlsruhe fast reactor and nine miles from the two Philippsburg reactors in Wurttemberg-Baden.

Over 70% of West Germany's airspace is available for low-flying exercises. The Bonn Environment Ministry argue that since the seventies, reactors have been designed to withstand a direct hit from a 20 tonne jet travelling at 516 mph. But, only 15 of the 22 operating reactors were built since this rule came into force.

The West German Green Party assert that since 1980 there have been nearly 180 military

jet crashes in West Germany.

● A new group has been formed to oppose low flying aircraft in the Snowdonia national park.

Malcolm Boater, founder of the Snowdon Balloon, Kite and Hang Gliding Club, told SCRAM that the club "will oppose low flying, particularly over Trawsfynydd, with peaceful and colourful protest."

The Club are collating data on extreme cases of low flying, and would like to see similar clubs formed in other areas. There have been 32 low flying aircraft crashes in the UK since 1982.

Snowdon Balloon, Kite and Hang Gliding Club, 11 Bontuchaf, Bethesda, Gwynedd, North Wales.

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Chernobyl

Two years after the Chernobyl disaster, when 135,000 people were evacuated from the surrounding area, evacuees are still living in 52 emergency villages.

According to Leonid Ilyin, who is leading the cleanup operation, the area is now safe enough for the residents to return. This has surprised many observers both inside and outside the Soviet Union.

In October last year, Prof Waleny Kukhar of the Ukrainian Academy of Science was quoted in the Dutch press as saying "Cleanup can't be done in a short time - we've enough work for the next 10 years."

The accident has cost the Soviet Union about £8 billion, and £2 billion for the rest of the world. £5.3 million has been paid out in compensation to UK farmers; and 122 farmers have additional claims of around £500,000 which fall outside the scope of government schemes.

Farmers have also been hit by falling land prices as a result of their contaminated soil. No-one really knows how much longer the restrictions on sheep movements will last, but predictions range up to 30 years. The UK escaped comparatively lightly; West Germany, for example, have paid out £140 million in agricultural compensation.

A recent report from Friends of the Earth, recalculates the number of cancers resulting from Chernobyl, using new studies from Hiroshima and Nagasaki. The number of fatal cancers world-wide is put at between 48,750 and 97,500, with a similar number of non-fatal cancers.

With the privatisation of the electricity industry looming, FoE have written to Cecil Parkinson to demand a Government re-think on nuclear power. "Bearing in mind the £8,000 million bill in the USSR, it is not reassuring to know that the current liability limit for operators of nuclear sites is a mere £20 million per station, plus £210 million 'top-up' in an emergency."

"Chernobyl - Two Years After."
Available from FoE 26-28 Underwood Street, London N1 7JQ.

Radiation levels

The new RIMNET radiation monitoring procedure is primitive and painfully slow, according to the authors of a new report for the Gaelic current affairs TV programme *Prosbaig*.

Using a new radiation monitoring technique, a team from the Scottish Universities Research and Reactor Centre (SURRC) at East Kilbride assessed levels of Chernobyl radiation in parts of the Western Isles and Galloway.

Radiation levels in the Western Isles reached 12,000 Bq/m² of caesium-137, according to the team. A recent calculation of UK caesium levels, by M J Clark of the NRPB and F B Smith of the Meteorological Office, published in *Nature* (17.3.88), estimated the Western Isles received levels of between 1,000 and 5,000 Bq/m².

Speaking on the *Prosbaig* programme Dr Sanderson, of the SURRC team, said "The levels of radiation in Uist show the Chernobyl plume has not followed the previous estimates of deposition patterns. There could in fact be fingers of the plume further north than previously supposed."

The technique used by the team involves the use of a scintillation counter mounted in a low flying aircraft. The counter, which detects gamma radiation, is sensitive enough to determine the level of natural radiation and to identify caesium-137 contamination above a limit of 3,000 Bq/m².

In a Written Parliamentary Question, Scottish MP George Foulkes asked the Scottish Secretary to commission a full aerial survey from SURRC to determine the residual levels in Scotland. The request

was denied. But, according to Dr Sanderson, the Scottish Office are "looking at it positively."

The *Prosbaig* survey calls into question the value of the Government's proposed Radioactive Incident Monitoring Network (SCRAM 64). Prof Murdoch Baxter, of SURRC, said "Monitoring arrangements for national coverage are painfully slow and technologically primitive. They are unable to identify high deposition areas quickly enough to ensure appropriate dose-reduction action is taken - for example, water and milk prohibition, lamb movement bans etc."

"After Chernobyl there was short-term confusion, even panic because there was no convincing picture of fall-out given by scientists and politicians. The system at the moment is unsuitable for the Scottish terrain, is inconsistent with the UK's heavy concentration of nuclear sites, and is incapable of coping with accidents at sea."

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Nuclear waste

A paper presented to the 1988 US Waste Management Conference has given UK anti-dumping groups further ammunition in their fight against Nirex's plans to dump nuclear waste in this country, but the paper's author came to an alarming conclusion.

John Bartlett of the Analytic Science Corporation, a Massachusetts-based think tank, said that we should not rely on technological models to predict the long-term performance of a repository. Although his paper refers to the American high level waste (HLW) programme, it is equally applicable to the British intermediate and low level waste disposal programme.

Limited data and current knowledge, according to Bartlett, cannot "prove or disprove suitability. Rules or guides for the HLW repository project will be based on statistically meaningless data and unprovable theoretical models."

Having recognised the 'trans-scientific' nature of building a repository to last 10,000 years, Bartlett concludes that further research is "not going to significantly improve our knowledge of geology, hydrogeology and zone transport." He comes to the alarming conclusion that the public should accept current limits in our knowledge and proceed with planned dumps anyway.

The irony is that geologist Jerry Szymanski, who has been doing research on the US HLW repository site at Yucca Mountain in Nevada, has concluded that tectonic pressure could cause the repository to flood with groundwater.

● The private Finnish electricity company TVO have begun building a low level waste dump beneath the Olkiluoto reactors in Western Finland.

The dump will be used for reactor wastes accumulated by TVO over the two reactors thirty year life. Because they do not reprocess nuclear fuel, this amount of low and intermediate level waste is relatively small.

An exercise to find a final repository for the spent fuel is meeting with intense local opposition.

Nirex

Scotland's most consistently pro-nuclear council, Highland Region, have voted against inviting Nirex to carry out further investigations of geological conditions in the area.

In a meeting which Cllr Michael Foxley described as a "watershed", even the pro-nuclear motion, which failed to get through, would have only allowed Nirex to dispose of nuclear waste produced in the Highlands; the repository would have had to be at Dounreay under UKAEA management, and the waste would have had to be retrievable.

"I think that the days of Highland support for the nuclear industry are over," commented Foxley. Only one councillor supported the Government's plan for a national repository.

The successful motion, which was carried by 24 votes to 17, concluded that on-site waste management at existing nuclear establishments is the best way forward. Therefore, the Council

therefore, "opposed to the establishment of a national repository ... in any part of Highland Region."

Meanwhile, the Scottish Nuclear Free Zone Local Authorities have called on the Government to convene a wide ranging Public Inquiry or Commission to examine the radioactive waste problem, and come up with an integrated strategy.

The Public Inquiry should investigate the feasibility of long-term storage facilities at the major sites of nuclear waste production.

They also want to see the abolition of Nirex and its replacement with a body which is accountable to the public rather than the nuclear industry. This new body should be responsible for all types of nuclear waste. They call on the Government to phase out nuclear power stations in the "shortest practicable period," and to abandon reprocessing.

The above policies, together with their criticisms of the deep disposal options, will form the basis of the Councils' response to Nirex.

'Non-nuclear' sites

James Cutler's Radioactive Britain TV programme, screened on 4 March (see page 10), has worried parents living near the Capper Pass smelting works near Hull, and has led to the formation of two separate inquiries.

Four times as many youngsters as expected have developed cancer in the villages of Anlaby, Willerby and Kirkella. Statistician, John Urquhart, puts the probability of this happening at a million to one.

Twelve children under 15 have developed various forms of cancer (7 of whom have died) over the past ten years. The documentary looked at radioactive emissions from non-nuclear sources, and pointed the finger at the Capper Pass smelter, which has a licence to emit 592MBq of polonium-210 weekly.

Professor John Fremlin, a former government radiation adviser, describes polonium as "one of the nastiest of the nuclear nasties," because it is readily absorbed and is distributed throughout the body.

The announcement of an inquiry by East Yorkshire Health Authority coincided with the diagnosis of two new young can-

cer victims. Professor Murdoch Baxter (Scottish Universities Research & Reactor Centre) and Dr Ray Cartwright (Leeds University's Leukaemia Research Group) were asked to review existing information on the radioactivity in the area, but the collection of new data has not been ruled out.

The Government promised another investigation by HM Industrial Pollution Inspectorate. Junior Environment Minister, Colin Moynihan, also promised the Government would release a list of about 1,100 non-nuclear establishments in England and Wales authorised to discharge radiation. He also announced a Ministerial review of laws which ensure that the regulation of such plants is conducted largely in secret.

A 3,500 signature petition from worried parents was handed over to local Tory MP, James Cran. Sue Coggin, representing the parents, said she would be much happier with an independent inquiry. But the MP is trying to persuade them an in-depth public inquiry would take too long; the inquiries already announced would be enough.

Uranium

The Transnuklear/Nukem bribery scandal has thrown up more debris in its wake. Nukem is to be wound up, and Degussa GmbH, who owned 35% of the company are to dispose of their holdings.

Degussa have themselves been implicated in the affair: they were aware of the scandal at a crucial stage of last year's Hessen elections when revelation would have jeopardised the chances of the pro-nuclear CDU. They delayed taking legal action until after the CDU had gained power.

Examination of Nukem's books has revealed a nice little earner which the company's fuel cycle division had been running under the noses of EURATOM, the EEC's nuclear watchdog.

Uranium, be it in the form of yellowcake, hexafluoride or tailings, is subject to many restrictions and safeguards, but different countries put varying constraints on its end use. For example, Australian uranium should not be used for military, or even enriched beyond 20% uranium 235; South Africa impose no restrictions on their uranium.

Furthermore, some countries embargo the use of uranium from Southern Africa. To attempt to meet these restrictions, each batch of uranium is 'flagged' both for country of origin and for end use.

Nukem (which controlled 80% of the world uranium trade) was swapping these flags to circumvent the restrictions. In these swaps, for which Nukem charged a premium, no uranium was moved, only documents changed hands.

In one case, involving eight different swaps, South African uranium was enriched in the USSR and used in Finnish reactors. Both countries embargo South African uranium but thought this material had come from Niger.

In another incident, Australian uranium ended up as high enriched material for a research reactor in France. This is expressly forbidden by the Australian parliament, without their written permission. To add insult to injury, some plutonium extracted from the reactor is used in French atom bombs which are tested in the south Pacific.

Chapelcross

The four plutonium producing reactors at Chapelcross in South West Scotland have been reprieved by a decision of the North Western Electricity Board (Norweb) to buy their power following the SSEB's decision to stop purchasing electricity from the plant.

The SSEB have terminated their contract with BNFL, the plant's operators, because it has become "increasingly less economic to take power from Chapelcross." BNFL have now entered into a contract with the SSEB to transmit the power to Norweb.

The SSEB refused to divulge to SCRAM the cost of Chapelcross electricity, because of "commercial confidentiality." However, in 1986, when figures were last shown in the SSEB's Annual Accounts, Chapelcross electricity was the most expensive being bought by the Board

because of monies set aside for the eventual decommissioning of the reactors.

Norweb also refused to disclose the terms of the new deal for the same 'commercial' reasons. They did reveal the contract is expected to last for the next ten years, and confirmed that they will be taking all Chapelcross's power.

A spokesman for BNFL told SCRAM that if the deal with Norweb had not come through, "we would have had to reconsider the situation, to say the least." However, the continued production of tritium at the site will be unaffected, he confided.

Tritium is produced by irradiating rods of lithium in the reactors. It is used to improve the yield of nuclear weapons. Plutonium from Chapelcross is separated at Sellafield for use in the weapons programme. The closure of the plant would have been most inconvenient for the MoD!

News in brief

TORNESS

The first reactor at Torness in East Lothian went critical at 1.20pm on Friday 25 March. The SSEB claim the station will start feeding electricity into the grid within two months.

The station is at least a year behind schedule and considerably above the planned cost.

ITALY

The Socialists have wrung a concession from the Ciriaco de Mita-led coalition Government. The partly-completed Montalto de Castro station will not be nuclear. Decommissioning work has started at the Latina magnox station and construction at Trino 2 has been abandoned. Italy now has only two operating reactors: Trino 1 and Caorso.

SWEDEN

The first two reactors to be closed under the nuclear phase-out plan will be at Barseback and Ringhals.

Barseback is on the south west of Sweden, and the decision to close only one of its two reactors has caused uproar

in Denmark - they are visible from Copenhagen yet the Danes have no reactors themselves.

In a recent opinion poll, over 50% of those questioned still support the Country's phase-out plans; and 38% would favour an immediate start to the phase out, even if it meant an electricity price rise.

SWITZERLAND

At a press conference to announce the abandonment of the Kaiseraugst BWR, Switzerland's sixth, the station's proponents revealed they did not really want it, as it was technologically outmoded and would have been uneconomic to build.

ARGENTINA

At the Atucha 1 reactor in Argentina the top of a fuel channel blew off during start up; over 50 tonnes of heavy water sprayed over the reactor internals.

The accident occurred last December, but has only recently been announced as one of the "technical faults" which have closed both Argentinian reactors, precipitating power cuts in Buenos Aires.

Fright Train!

The London Nuclear Information Unit Conference in March brought the issue of nuclear flask transport into the public arena again. They published a report by Large & Associates which criticised the CEBG assessment of flask safety criteria. JIM FITZPATRICK describes the FBU's view of the hazard posed by flask accidents.

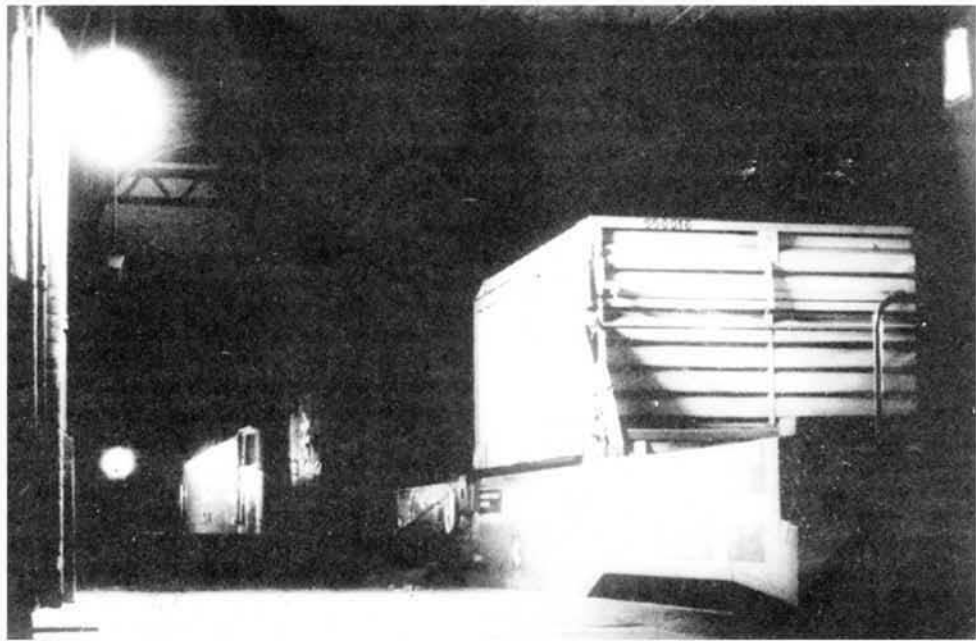


Photo: Martin Bond

Nuclear waste trains came to the attention of the London public in 1979/80, amid a blaze of publicity. However it is of great concern that the Capital's firefighters were only made aware at the same time. Indeed they found out through the same sources as the public - the media and environmental groups.

It is an acknowledged fact that when 10 to 20 tonnes of irradiated fuel passed through London from Sizewell and Bradwell, only the most senior officer of the London Fire Brigade was informed. No notice was given to fire stations through whose territory the trains passed or converged, nor the routes or frequency of the trains. The reason for this is, surprisingly, 'security'.

Back in 1979, when the issue was first discussed by firefighters, a number of points quickly surfaced. These were soon adopted as official union policy by the London Region:

- More information
- Basic Training
- Better Equipment
- Stop the Trains

The fourth point was obviously a political statement around which the London Region of the Fire Brigades Union have campaigned for years. The 1981 FBU annual conference passed a resolution to this effect, and the London Region have associated themselves consistently with local groups agitating around the issue of trains carrying nuclear waste.

In respect of the technical and professional questions raised the Brigade were quick to respond. Their initial reactions were to:

- Withdraw Operational Note 30 which out-

lined radiation procedures and review it comprehensively. However, when it was reissued four years later, virtually the only amendment was the inclusion of photographs of the flasks and the wagons which carried them. A small improvement: at least we all know what to look for at last.

- 'Find' an American nuclear industry film which showed American trains and flasks being tested. This was screened to all personnel as a matter of urgency.
- Undertake to review our radiation equipment, which then consisted of dosimeters and survey meters attached to front line appliances.
- Undertake to review training arrangements at the same time as withdrawing Operational Note 30.

(Incidentally, the Brigade also disciplined staff who spoke to the media expressing concern at the lack of protection being given to the Capital in the event of an accident.)

After years of dialogue and research the present position is little changed. There has been no training exercise conducted in London to counteract any prospective emergency involving a nuclear train. However, there have been alerts, but they have all proved to be false alarms. These false alarms have proved that, if there is no leakage or actual fire, the firefighters cannot do anything until the arrival of experts from Sizewell or Harwell. Their journey time can be anything from one to three hours. If there was a fire the Brigade is supposed to stand at a distance of 50 metres and spray water to keep the flasks cool and await expert advice.

In the event of a flask breach our members are expected to minimise and contain spillage, and cool the flask if there is any loss of coolant, until the experts arrive. Due to the lack of information on the transportation of nuclear waste by train, it is distinctly possible that if such a train was involved in a fire (with the attendant smoke and chaos) our firefighters may not be able to readily identify it as carrying nuclear waste until they have been too close for too long. Hopefully it won't happen, but it is something that no one can guarantee.

The equipment we carry has been improved - we have had the survey meters replaced by Wallace Radiac meters - but there are still only dosimeters for front line crews. Incidentally in the post Chernobyl working party set up by the Home Office the FBU are locked in bitter dispute with the authorities over the appropriate dose rates our members should be exposed to. The recent recommendations of the National Radiological Protection Board to reduce occupational exposure levels have not been wholeheartedly welcomed by the powers that be, to say the least.

IN CONCLUSION:

- We are still not informed of the route nor the frequency of the trains, although anyone wishing to determine such can do so, apparently with little difficulty.
- We train for almost every contingency from jumbo jet crashes to Kings Cross type disasters, but not for nuclear incidents involving trains. Either the accepted logic is there can be no breach of the flask, or to practice for evacuating sections of

central London would be alarmist or impracticable.

Certainly the report on flask safety published by the London Nuclear Information Unit from Large and Associates completely undermines the bland assurances given by the Central Electricity Generating Board and British Rail after the train crash they staged at Old Dalby in 1984.

- There have been improvements with better equipment, but it doesn't protect us - it only advises us how much contamination there is and its extent.
- The trains are still running. This must be the ultimate statement.

London firefighters are no better nor worse prepared for a flask incident than any of their colleagues in Britain. Chernobyl showed us that firefighters do their duty to protect their communities as best they can even at the expense of their own lives. British firefighters are no different from their Russian comrades.

Also, it is worth bearing in mind that, since the abolition of the GLC, London has lost 10% of its firefighters. The latest round of cuts approved by the Tory/Alliance councillors (the London Fire and Civil Defence Authority is a hung authority) covered specialist staff, one of whose many jobs was decontamination procedures.

JIM FITZPATRICK is the Regional Secretary of the Fire Brigades Union, No. 11 Region London Fire Brigade.

Radioactive Britain

According to Yorkshire TV's 'Radioactive Britain' programme, there are a number of UK non-nuclear sites which discharge radioactivity or are radioactively contaminated. PATRICK GREEN outlines some of the research for the programme.

Most people associate exposure to ionising radiation with discharges from the nuclear industry, from accidents like Chernobyl or from naturally occurring radionuclides like radon gas. What is not commonly known is that a large number of 'non-nuclear' sites in the UK may expose members of the public to ionising radiation. These include factories which discharge radioactivity into the environment, old factory sites which are contaminated with radioactive material, and private or local council waste tips which are used for the dumping of low level radioactive waste.

Unfortunately for the public, very little is known about these sites, where they are situated and the quantities of radioactivity they are allowed to discharge. The following are some of the known examples and are taken from the Yorkshire TV programme Radioactive Britain.

Over 5,000 sites in the UK are licensed under

the Radioactive Substance Act 1960 to discharge radioactive waste into the environment. These discharges are normally gaseous although some sites also discharge liquid waste. In some cases the quantities of radioactivity involved are exceedingly large. A Rio Tinto Zinc lead smelting works in Humberside has an authorisation, from the Department of the Environment (DoE), to discharge 592 MBq per week of polonium-210, (an alpha emitter), through a 180 ft chimney stack. This is 3 times the level of alpha-emitters that Sellafield can discharge through its stacks. Polonium-210 is a naturally occurring radionuclide and arises from the production of tin and lead from their ores.

DISCHARGES KEPT SECRET

The plant's certificate of authorisation states that the company should take steps, so far as is reasonably practicable, to ensure that this gaseous waste does not enter the factory

premises. It does not mention means to limit public exposure, except that under the 1960 Act, they have to use the best practicable means to limit the radioactive content of the waste.

A major shortcoming of the Act is that a company is not required to notify the public or their representatives that radioactivity is discharged from a site, in fact they can face up to two years in prison for doing so. The 1974 Health and Safety at Work Act requires a factory management to take steps, so far as is reasonably practicable, to ensure the public are not affected by their activities, and to provide information on the hazardous nature of operations. Clearly, these two acts are contradictory.

Another site at Newport in Gwent, owned by British Telecom Consumer Electronics Ltd, is licensed to discharge 1 GBq per month of tritium to the atmosphere. The authorisation does not require the site owners to limit discharges within the maximum permissible level. Furthermore, the tritium is allowed to be discharged directly to the atmosphere from the factory site - the authorisation does not require the use of a chimney stack. However, even with a stack, as Sellafield experience shows, public exposure still results.

CHILDREN'S 'PLAYGROUND' CONTAMINATED

A chemical factory in Ilford, surrounded by a housing estate and overlooking a school, was closed down in 1980. The site is contaminated with a range of chemical materials and also with radioactive radium-226. A private company has permission to develop the site for housing.

Friends of the Earth have carried out three separate surveys of this site and have found a series of 'hot-spots'. Around the perimeter fence the increase reaches 2-4 times normal background levels. On site, the increase ranges from 2-50 times background. The site is used by local children as a playground.

At the recorded level of gamma radiation dose-rate on the site, children would only have to play in the most contaminated areas for around 3-4 hours every week of the year before receiving a dose approaching the National Radiological Protection Board's (NRPB) 0.5mSv site-specific limit. This is based upon the whole body dose alone and does not take into account inhalation or ingestion of contaminated material or that a child may live next to the site. Local residents have not been informed of the hazard.

With this particular factory, two different routes of public exposure exist: as a result of the increased background level in the area; and by inhalation of dust blown from the site. In both cases children playing on the site will be most at risk. The biggest risk will arise when building and clearing work for the con-

struction of the new housing estate begins. This will generate very large quantities of contaminated dust which may be inhaled by local residents and children at the local school.

"GROSSLY IRRESPONSIBLE"

Following the programme Frank Feates, Chief Inspector of Radioactive Substances at HM Inspectorate of Pollution, stated of the site: "If children were playing on it, they were at no greater risk than if they were playing on swings." Considering the dose-rate levels recorded by FoE this statement can be dismissed as grossly irresponsible. The site is not secure and children can easily get onto it through holes in the fence or simply by opening an unlocked gate.

In 1980 a Smiths Industries factory in Gloucestershire was found to be heavily contaminated with radium during a routine inspection by the Factory Inspectorate. During World War Two luminous dials for aircraft were manufactured there. Large areas of the plant, inside and out, were found to be contaminated.

During the clean-up operation, about 209 tons of earth were moved. Highly active waste was sent to the waste dump at Drigg in Cumbria; the less active material was dumped on a local private waste tip. This tip is open to the public and local children frequently play on it. Radiation readings are 30 times normal.

The company have claimed that the decontamination procedures were very thorough. However, during the clean-up operation large quantities of contaminated dust would have been unavoidably produced, posing an inhalation hazard.

It is not known how many of the 5000 sites licensed to discharge radioactivity, or contaminated sites like Ilford, put local communities at risk. However, it is clear that the public are exposed to ionising radiation from a variety of non-nuclear sources and that in some cases the level of exposure may be high, and in these cases people are at risk.

It is clearly unacceptable that, under present law, the public have no right to know that these sites exist and have no access to data about the levels of radioactivity discharged into their local environment. Furthermore the NRPB do not consider radioactive discharges from non-nuclear sites in their assessment of public exposure to ionising radiation.

The contaminated sites are a legacy from the past. Unless the secrecy clause of the Radioactive Substances Act is repealed: how many of these 5000 non-nuclear sites will become contaminated sites for future generations?

PATRICK GREEN is FoE's radiation consultant

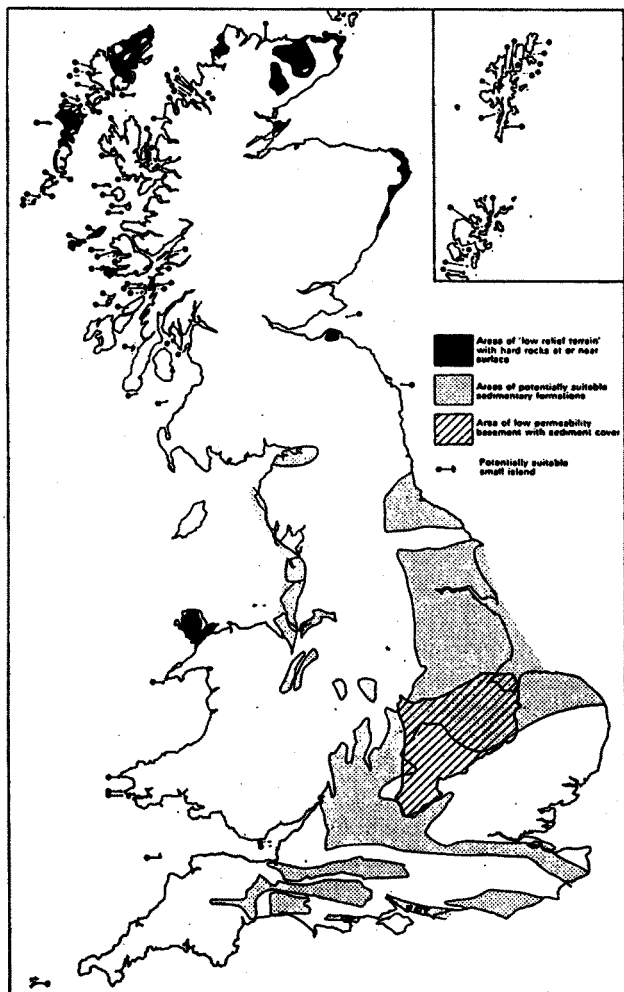


Disused chemical site in Ilford

Rocks of Ages

Nirex claim that current techniques are capable of identifying safe geological conditions for the disposal of nuclear waste. In this article ELSPETH REID suggests, through quotation from recent research papers, that the necessary predictive science does not yet exist.

Later this year, Nirex intend to nominate a short list of potential repository sites. Selection criteria will be geological but the choice will be further narrowed down by demographic, political, social, industrial, economic, legal and logistic considerations. The arguments about most of these are being well-aired; the geological arguments however seem to be little known. Statements have been made by both supporters and opponents of a national repository which specifically or implicitly accept Nirex's assertions that geologically containment is proven. So wider discussion is clearly necessary.



Geological environments considered suitable for deep disposal of long-lived intermediate level wastes. (2)

Nirex's 'The Way Forward' is very closely based on a paper by Chapman, McEwen and Beale, geologists employed by the British Geological Survey and Nirex itself. Their paper proposed, in the authors' own words, a "novel" concept of hydrogeological containment and dispersal of radwaste which "departs from earlier guidelines for high level waste (HLW) repository site selection." These new ideas were aired at an international conference on radwaste in 1986.

Within a year the new ideas which the authors presented as the basis for an extensive research

programme had become UK government policy and Nirex's brief. It seems unlikely that at a prestigious international conference, representatives of the UK geological establishment would get away with calling something new that was in fact old hat.

GROUNDWATER MOVEMENTS

The ultimate containment for mobile radionuclides is envisaged by Nirex as a geological one - and specifically a hydrogeological one. Groundwater circulates deep underground to depths of perhaps 1500 metres. Circulation may be rapid (as in aquifers) or very slow, retaining water in a relatively small area for thousands of years. The Nirex theory is that sub-surface water flow, which concentrates in pathways of least resistance, will carry dissolved radionuclides away from a repository either to be diluted, or so slowly that they will have decayed to relatively innocuous levels by the time they reach the biosphere.

The chemistry of groundwater, as well as its physical dispersal, affects the mobility of radioactive material. And some researchers are investigating the possible effects of bacteria - which could multiply rapidly in a repository - on water chemistry and hence on the stability of radionuclides in the rock environment.

Underground water moves through interconnected pores in permeable rock, along interfaces between different rock types, through microfractures, along faults, joints and other discontinuities. Even apparently massive, homogeneous rocks like granite are almost invariably jointed, fractured, deeply weathered, faulted and chemically or physically variable.

Movements of underground water occurs in association with these fractures and discontinuities. Upward movement is familiar to many people in the form of hillside springs; it isn't hard to imagine how pressures increase with depth below the surface so that if water reaches a permeable zone where it can flow fast, it gushes up as the pressure is released.

Methods of aerial infra-red imaging are being developed which, in favourable circumstances, can detect regional groundwater patterns. However, such techniques cannot reveal whether near surface water and deeper circulating waters are linked or decoupled. So other ways have to be found to test whether radioactive water emanating from a deep repository would reach the surface. It would be more difficult to decide where on the sea bed upwelling might occur.

INSUFFICIENT INFORMATION AVAILABLE

The foregoing is intended to provide a more realistic description of the hydrogeological environment than has been attempted by Nirex. Since hydrogeology is fundamental to the present

proposals, a basic understanding is important for informed discussion.

Both physical and chemical techniques exist to unravel the history of groundwater and its probable flow paths and rates. That is not in dispute. What is in dispute is whether there is an adequate database on which to base the rigorous predictive science necessary for safe and publicly acceptable radwaste disposal. In selected cases it is possible to say: "this is what must have happened to the groundwater in this area over long periods of time." That is not the same as saying: "we can predict exactly what will happen to groundwater flow after we have altered the circumstances of our original investigations by excavating extensive underground caverns."

Nirex say that detailed investigations of carefully chosen sites, using a range of geological, geophysical and geochemical techniques can identify safe conditions. Scientists doing the front line research say - at least in recent published papers - that they can not, or at least not yet. This is important because Nirex intend to build an underground repository whatever the outcomes of research.

The small selection of quotations (see box) is from work published in 1986 and 1987. Most of them are from a paper whose stated purpose is to "assess our current state of knowledge." Yet a spokesperson for Nirex said to Highland Regional Council that "a repository will be built," and "we are doing research to prove that deep disposal is safe."

Fortunately the researchers seem, in fact, to be following the more normal and reliable procedure of doing research to establish whether available data can form the basics for theories and predictive models. And by their own testimony they have not come up with the answers.

The credibility gap between such statements from senior Nirex employees, apparently responsible for public consultation and policy decisions, and scientific and technical realities should be widely publicised and commented on since it seems to indicate that taking unacceptable liberties with the facts of the matter is built in to Nirex's brief. These liberties are even less acceptable in the light of the fact that a number of the caveats contained in the above quotations are identified by their authors as suggestions and advice to those responsible for radwaste disposal policy.

POLITICAL AND ECONOMIC MOTIVATION

A reasonable conclusion seems to be that what Nirex designates as "detailed site investigation" would actually be an extended programme of basic research. And indeed this

conclusion is confirmed in the 1987 paper by geologists at the British Geological Survey, carrying out government funded research on radwaste disposal:-

"The necessary testing, technological development and experimental work could not be carried out as a large-scale dry run exercise simply be-

"The new approaches of fracture network theory which are unwieldy at present and unvalidated, need further development. Most existing data are not able to validate these new concepts and new experimental approaches are needed."(2)

"We cannot interpret hydraulic tests in fractured rocks out to long distances."(2)

"There is a lack of experience in applying the available technology and interpreting the results."(2)

"There is no significant database on the behaviour of many radionuclides in the hydrographic and marine environments."(2)

"The magnitude of the effect of faulting on radionuclide migration is unknown."(1)

"Geochemistry may be altered as a consequence of hydrogeological modification in both near and far fields (the far field is the geological environment, the near field the engineered one) so that dissolution, speciation and mobility of radionuclides are not as predicted."(1)

"At present we still lack a useful database on deep mudrock (fluid flow) properties which inevitably results in a circumspect approach to site selection."(2)

"The study highlighted the difficulties of predicting the stability of stagnant groundwater zones resulting from small topographic features."(2)

1 Black, J H et al, 1986. *The role of Faults in the Hydrogeological Environment*, FLPU 86-9, British Geological Survey.

2 Chapman, N R et al, 1986. *Geological Environments for Deep Disposal of Intermediate Level wastes in the UK*, in *Proceedings of an International Symposium Organised by the IAEA*.

cause of the expense and the disruption that would be caused."

It appears then that the expense and disruption will be imposed on the nation and locally on specific communities, not with the scientific purpose of establishing and evaluating the facts, but with the political or economic or social purposes of building a repository whatever the facts.

Real research, as opposed to "site investigation", might show that appropriately high confidence prediction of radionuclide dispersion in the hydrogeological environment is impossible, elusive or uncertain. In either case there will be years of expense and disruption before results are known. However the outcome is predetermined - "A repository will be built" - if we allow it.

ELSPETH REID is a college lecturer and Open University science teacher.

Dissolution No Solution

A 'lead demonstration' nuclear waste processing plant currently being commissioned at Dungeness, which will evade the 1983 sea dumping ban, could be built at each CEBG magnox station. The plant will dissolve a backlog of magnox debris, and discharge the resulting radioactive solution into the English Channel.

STEVE MARTIN asks why the CEBG have decided on this process when both BNFL and the UKAEA are going to encapsulate this type of waste in cement and store it on site until a disposal route is available.

The Central Electricity Generating Board (CEGB) are to dissolve 60 tonnes of nuclear waste, currently stored at Dungeness A magnox station, and discharge the resulting solution, after filtering, into the English Channel. No public inquiry was held and no Environmental Impact Assessment has been drawn up.

The Dungeness plant is to be a "lead demonstration plant" and "will allow for the preferred process of carbonate dissolution to be fully proven in active operation before further decisions are taken on the appropriate process for the majority of CEBG magnox stations"(1) - in other words, if this full-scale experiment is successful they could build a similar plant at other magnox stations.

The waste, accumulated between 1967 and 1976, consists of magnesium alloy lugs and splitters which were removed from magnox fuel elements before despatch for reprocessing. They are attached to the fuel elements to enable their correct insertion into the reactor core (see photo). The plant is expected to begin processing the waste backlog in July or August this year.

However, the UK Atomic Energy Authority (UKAEA) and British Nuclear Fuels (BNFL) have decided to encapsulate similar wastes in a cement-based matrix, "with the resulting solidified wastes being held on site in engineered retrievable stores until such a time as a suitable disposal route is available."(2)

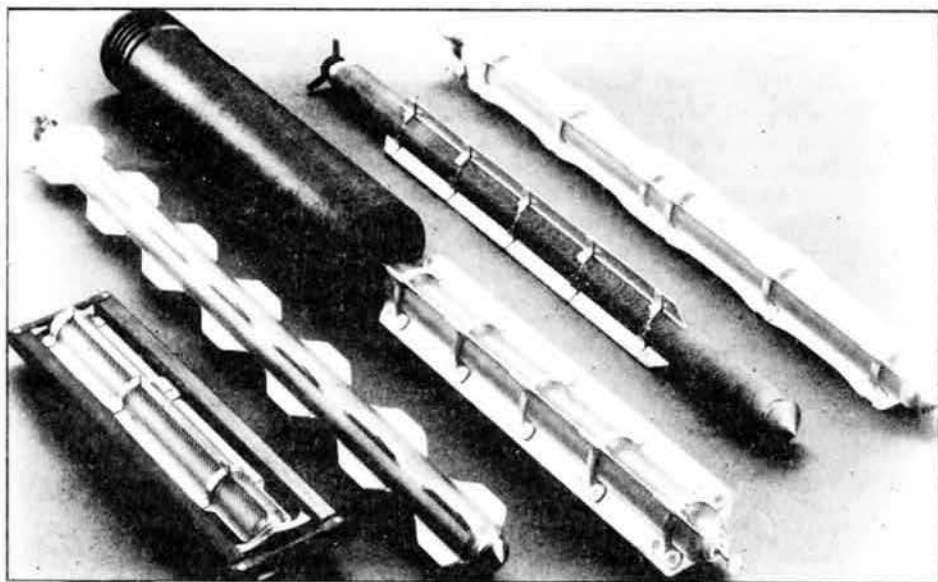
The Dungeness vault contains 57 tonnes of sludge, and 3 tonnes of uncorroded debris are stored in a separate pond. Although there is sufficient storage space for further debris arisings the CEBG have decided to test the process at Dungeness because "accumulations of ... sludge and ... metallic debris were both available."(1)

The process is intended to produce "a small volume of concentrated waste which can be better stored and monitored whilst awaiting a final disposal route,"(3) but a large volume of low activity liquor will be discharged into the sea. Comparisons with Sellafield's reprocessing

operations are obvious - it too is described as a volume reduction exercise: large volumes of low level liquid waste are discharged into the Irish Sea leaving behind a high level residue.

The CEBG claim the material to be processed can be classed as low level activity because it has had time to decay from its original intermediate level classification. This is difficult to reconcile. Although many of the 40 or so radionuclides present in the sludge have short half lives, measured in days, others remain radioactive for years, including plutonium and other alpha emitters. John Large, an independent nuclear consultant, believes these fission products have got into the vaults due to prior mismanagement of the stripping process - at the time when this was carried out the proposed system was not anticipated, and hence they may not have been as careful as they should have been.

However, Peter Burrows, a member of the CEBG's



Magnox fuel elements, showing splitter and lug attachments

design team, has revealed that they don't know exactly what proportions of radionuclides are contained in the sludge: "We don't know there's definitely no 'rogue material' in this vault."

'ROGUE MATERIALS' PRESENT

A batch of sludge will be removed from the vault and dissolved in water through which carbon dioxide gas is pumped. The resulting solution will be fed through a series of fine sand filters to remove particulate matter. The filtered solution will collect in tanks at the end of the process line, before being discharged to the

English Channel.

The sludge batch is screened to ensure material over a yet to be prescribed limit does not get into the system. If too much activity is found in the batch it will be returned to the vault. So, as Peter Burrows puts it, "eventually any rogue materials not able to be removed will remain at the bottom of the vault."

One item of 'rogue' material is a nimonic spring. Each fuel element has one of these steel springs attached to it, and they are removed at the stripping stage. Although it is CEBG practice to store these items separately, they are only 15mm in diameter and 30mm long and it is "not impossible" that they have found their way into the vault - about 10,000 springs are separated each year, and there does not seem to be an adequate procedure to definitely account for each spring. Each spring contains about 15GBq/g of cobalt-60, and is described as high activity.

CONCENTRATED WASTE WILL ACCUMULATE

It is implicit that concentrated waste will accumulate, and the intention is, according to Peter Burrows, "to see what we've got and how much we've got, and make provision to deal with that." They will go back and "seek approval from the authorising ministries and the NII as to a means of removing it." This attitude of 'suck it and see' gives the distinct impression that the CEBG are pushing ahead to commission an experimental process not yet fully thought out.

At the end of the process the filtrate will be sampled and, if the activity is too great, it will be cycled through an ion exchange system (IXS) to remove that activity. The 'trigger-level' for the IXS has not yet been decided. The intention is to use the IXS as little as possible to reduce costs, and the on-site accumulation of radioactivity. According to the CEBG's Radiological Impact Assessment, it will only be used "for a sufficient period to generate reliable data on the decontamination factor achieved using the particular IX resin to confirm the existing laboratory data ... approximately 37 days of operation during the 3-4 year period."(4)

DISCHARGES CONTRAVENE SELECT COMMITTEE

It is clear, therefore, that alpha emitters will be discharged into the English Channel. In the case of americium-241, a particularly hazardous radionuclide, the CEBG estimate that twenty times as much will be discharged from this plant than that assumed from the Dungeness B AGR station. Almost twice as much alpha activity as from the B station and more than ten times as much as from the A station could be discharged, according to CEBG figures.

The 1986 Environment Committee Report recommended that no low level radioactive waste should contain alpha emitters. Also the philosophy of 'dilute and disperse', which this operation encompasses, has been criticised by authoritative bodies such as the Paris Commission and the Environment Committee. Even the Government's submission to the Paris Commission in 1986 argued that a policy taking account of the best available technology should replace the present as low as reasonably achievable policy.

The plant has an operational life of 30 years, yet the backlog is expected to take only 3-4 years to be treated. Mr Burrows explained that the plant will then be mothballed and brought back on stream when the power station is decommissioned to treat the arisings of lugs from the present fuel element design, about 6 tonnes a year. It is feared the plant may also be used to dissolve other materials at the time of decommissioning.

NUCLEAR INDUSTRY SPLIT

Treating the sludge in this way when it could be left in the vault seems a pointless exacerbation of the waste problem, inevitably leading to avoidable operator exposure. The CEBG argue that "the continued on-site accumulation of radioactive waste is ... not in accordance with current British policy."(1) But the UKAEA interpret the policy differently: "it is consistent with national strategy ... to use existing disposal options where available; and where no disposal route currently exists, to treat and store such wastes on site until a national repository is available."(5)

The NII have not yet granted a licence for the operation, but have allowed the commissioning to progress thus far. A final licence would set a precedent which will eventually be extended to other magnox stations. As well as avoiding the sea dumping ban, it flies in the face of the Nirex public consultation to assess public opinion on how such waste will be treated. Dispersing it around our coasts is not one of the Nirex options, and would no doubt cause a public outcry if it was.

The CEBG's plans are highly irresponsible, when other parts of the nuclear industry have decided, after years of research, to use an encapsulation process involving minimal discharges. This indicates a major split within the industry. A BNFL spokesman said he was "unaware the CEBG were building such a plant," but he regarded BNFL's decision as one which "fits in with the UK's long-term strategy."

The NII should refuse to allow the final commissioning of the plant, otherwise large quantities of waste could be dealt with in this way as magnox stations are decommissioned. This shabby waste management will be to the detriment of the marine environment and our children's health. The CEBG should admit their mistake, scrap the idea, dry off the residues and encapsulate the lot.

1 *Passant, F H et al, CEBG dissolves magnox fuel element debris at Dungeness, Nuclear Engineering International, February 1988.*

2 *Howarth, G G, Encapsulation of intermediate level wastes by BNFL, Atom, March 1988.*

3 *CEBG, The Dungeness 'A' Dissolution Plant, publicity leaflet, 1986.*

4 *Burrows, P I, Assessment of the Radiological Impact of the Proposed Magnox Dissolution Plant at Dungeness 'A' Power Station, GD/PE-NW/0009 CEBG, October 1986.*

5 *Sayers, J B & Price, M S T, Radioactive waste management, Atom, September 1987.*

Flogging Off a Dead Horse

With the publication of two White Papers, one for England and Wales and the other for Scotland, on the privatisation of the electricity industry, it is now clear that nuclear power is to be protected from market forces, whilst coal will be dealt a severe blow. PETE ROCHE looks at the White Papers and concludes that there may be some good coming from privatisation, but not much.

The concept of privatisation was virtually absent from the Tories' 1979 manifesto. It has developed almost by accident to raise the money needed for tax cuts. Unlike British Gas and British Telecom, which were privatised as virtual monopolies, the Government are committed to introducing competition into the electricity industry as "the best guarantee of the customers' interests."

Privatisation will apparently free the electricity industry from government intervention. Yet the legislation will place a statutory obligation on the distribution companies to buy a "specified minimum proportion of non-fossil-fuelled generating capacity." In Scotland, where over 50% of electricity will be nuclear generated when Torness becomes fully operational, the situation is slightly complicated. Here some investors were looking forward to the prospect of a private power board in the North of Scotland free from nuclear power. But the Scottish Secretary couldn't allow a Northern Board to be favoured at the expense of a Southern one. Instead each Board will share the nuclear capacity so all Scottish consumers can retain "access to this economic supply of electricity." The Government are, after all, "determined that public confidence in the nuclear programme should be maintained." (emphasis added)

How investors will react to an invitation to invest in nuclear power is still unclear. Hamish Morrison, chief executive of the Scottish Council, Development and Industry, a widely representative body which promotes industry in Scotland is sceptical: "the more I examine the

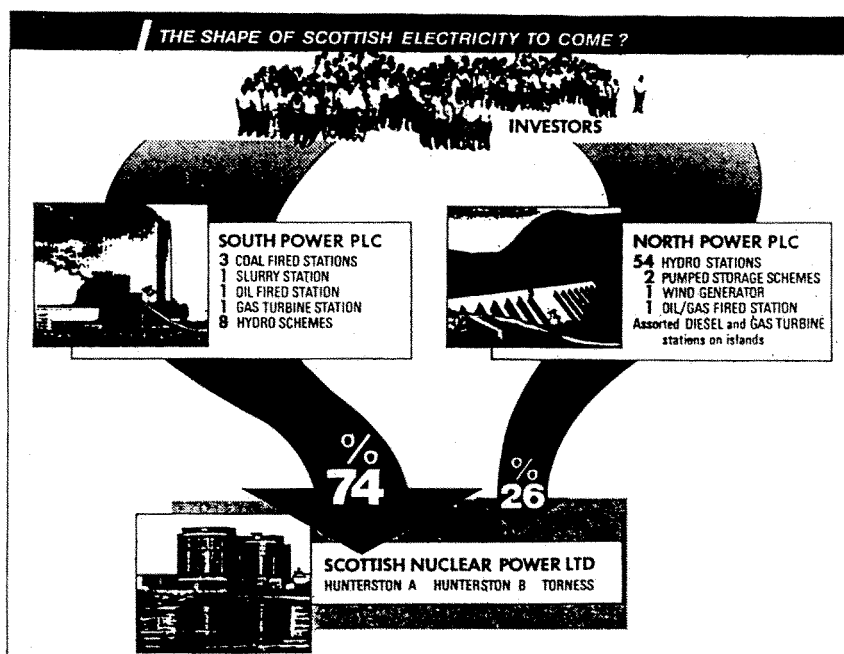
issue, the more I am convinced that the investment community is not ready for nuclear power."

Why should the public believe nuclear power will be safe in the hands of directors whose main motivation is to make a profit? We are told that the Nuclear Installations Inspectorate (NII) will have all the resources necessary to perform its duties. In 1987 the Common's Energy Committee expressed concern when they found the NII over 17% understaffed. And there is still an enormous backlog of work, not least of which are the much delayed Magnox safety reviews.

COMPETITION?

Splitting the Central Electricity Generating Board (CEGB) into two companies is supposed to introduce an element of competition. Yet the 70% of present generating capacity, which will presumably be bequeathed to Lord Marshall, would be classed as an excessive market share and a threat to free competition under any monopoly legislation in the world, including the UK. It will certainly call into question the independence of the smaller generating sibling.

In contrast, Scotland is to retain "vertically integrated boards" and instead of real competition, will suffer from a new monetarist experiment known as "yardstick competition" or "competition by comparison." And the Scottish Boards will be able to "contribute to the competitive market for bulk power in England and Wales," or, in other words, sell off their overcapacity at knock down prices, "thus facilitating the most efficient use of resources over Great Britain as a whole."



We are told by Cecil Parkinson's White Paper that as long as there is a monopoly "there is no effective way of telling whether costs are as low as they could be." This must be news to Malcolm Rifkind whose White Paper states that "the Monopolies and Mergers Commission conducted thorough investigations into the efficiency of each of the Boards and they each emerged well from these inquiries."

Both White Papers claim that privatisation will be good for the economy. If the recent row between the South of Scotland Electricity Board (SSEB) and British Coal is anything to go by, it is difficult to see how this could possibly be the case. The SSEB have already signed contracts to import 1 million tonnes of coal, and although an interim deal lasting

3 months from 1 April has been worked out, the prospects for Scottish Coal look bleak. Even though British Coal were granted an interdict to prevent the SSEB from burning imported coal at Longannet and Cockerzie, the SSEB remain unperturbed - they can always burn oil at Inverkip and imported coal at Kincardine.

They've also been looking at the possibility of burning North Sea Gas as an alternative source of power station fuel in the 1990s. Despite recent increases in gas prices, the UK is likely to be connected to the European Gas Grid in 1992 leading to a downward pressure on prices. It would also be in the oil companies interests to buy their way into the electricity market by offering cheap gas at introductory bargain prices. This would represent a fundamental change in policy - until now gas has been regarded as too valuable to burn in power stations and has been reserved for premium markets such as domestic heating.

ELECTRICITY CONSERVATION

The England and Wales White Paper describes the need for "a substantial new investment programme. . . to replace old plant and meet **growing demand**." (emphasis added) Practically no other western industrialised countries are going down this road without considering the role of electricity conservation and load management. The White Papers make no mention of conservation. The Americans who, like us, favour the use of competition to achieve 'least cost' electricity services, have discovered, according to Dr Naill of Applied Energy Services, US experts in energy forecasting, "competition from energy conservation technologies has occurred as the price of electricity has risen, making it more attractive to conserve electricity."

But there is a glimmer of hope. The new distribution companies will be allowed to diversify, and their obligation to ensure security of supply will hopefully provide an incentive to look more closely at conservation and load management. However, US experience shows that it's only when the regulatory authority is given the power to require investment in the 'the least cost resource' that utilities start to take conservation seriously. The UK regulatory bodies would have to have far wider powers than OFGAS to end the gross mis-allocation of resources to supply rather than demand management. The White Papers give us few clues as to how the regulatory bodies will be organised.

The distribution companies will be allowed to build their own power stations and private generators will be given access to the Grid. This could lead to a rush to build small scale power stations and even investment in renewable technologies. The East Midlands Electricity Board are leading the way and have already identified five schemes worthy of further investigation. They are already involved in the Leicester CHP scheme in Corby. The Eastern Electricity Board are also looking at a CHP scheme for Basildon in Essex.

PRICES AND DEBT

Electricity prices in England and Wales are to rise to pay for the CEB's expansion plans, but

the Scottish White Paper makes no mention of how the debts already incurred by the Scottish Boards are to be paid off. At March 1987 the SSEB's debt burden was £1,870m and the Hydro Board's was £483m. No one is likely to buy them in that condition. So Malcolm Rifkind will almost certainly have to write off a large part of that debt, but much of it is owed to overseas lenders. The SSEB owes £569 to the European Investment Bank and £672m to other overseas lenders, which means that Rifkind will have to put his hand in the taxpayers pocket to pay them off.

The White Papers give no mention of a 'golden share' - this method of ensuring our strategic industries don't fall prey to multinationals or foreign governments has been discredited now that BP have been allowed to swallow Britoil. So we have no idea whether the Government intend to include a clause in the legislation to prevent the outside take-over of our electricity industry.

Despite the Government's often stated support of nuclear expansion, the White Papers do not constitute the guarantee the nuclear industry would have liked. The distribution companies are required to take a certain percentage of non-fossil generated electricity. This could come from renewable sources as well as nuclear. A rush by private generators to build small-scale power stations would help to reduce the pressure to expand the PWR programme, and if the regulatory body is given the right powers, electricity conservation could receive a boost.

EMPLOYMENT KNOCK-ON EFFECTS

But these small advantages must be weighed against the colossal damage which will be done to the coal and power engineering industries. John Prescott, Labour's energy spokesman, claims that privatisation threatens up to 75,000 jobs. An NUM study concluded that 100,000 jobs were at risk in electricity, coal, transport and power engineering. The knock-on effect would produce a further 70,000 job losses. There are far easier and less disruptive ways of supporting electricity conservation, renewable energy and small-scale power stations.

The Government claim to respect the judgement of the markets, yet they are prepared to set aside this judgement where nuclear power is concerned. We currently have at least some democratic control over nuclear policy. Now we have the prospect of a privatised electricity industry, (whose main concern will be to make profits for shareholders), responsible for nuclear safety and waste dumping. They will not be concerned about the British economy or our environment. Ownership of shares, and ultimate control of the industry will be open to the oil multinationals - the very companies who control most of the coal the electricity companies are threatening to import, and who have a vested interest in seeing our publicly controlled coal industry closed down.

On the whole, to paraphrase the Glasgow Herald, the White Papers make miserable reading; the analysis is half baked, the assertions are unsubstantiated, and the proposals so incomplete that they are virtually impossible to evaluate.

Renewable Energy in India

The international nuclear energy lobby consistently peddle the myth that industrialised countries must keep up their nuclear power R&D programmes because developing countries are experiencing acute energy shortages: nuclear power is put forward as the only solution. But, as this article shows, 90,000 Indian villages remain unconnected to the country's grid - how can nuclear power possibly solve their energy crisis?

Professor SUJAY BASU describes how renewable energy technologies are being introduced into villages as part of a national programme, and how energy training centres have been developed at some educational institutions in the country. Renewables are filling the gap which nuclear power never could.

India is a country blessed with good sunshine, and the wind blows strongly in regions along the long coastline. Nearly 600,000 villages mostly depend on non-commercial fuel, and although more than 65% of them have been electrified so far, four out of five households are still without any electricity connection. Moreover, the Indian Government's Advisory Board on Energy has admitted, in its May 1985 report on energy demand and supply in 2004/5, that 90,000 villages will remain virtually inaccessible by the electricity grid.

It is obvious, therefore, that alternative energy sources will have a principle role to play in meeting the energy needs of a large sector of the population.

The Department of Non-Conventional Energy Sources (DNES) under the Indian Ministry of Energy is the only central agency entrusted with the development and promotion of alternative energy sources. In its five years of existence the Department, through direct funding of State agencies, has succeeded in initiating development and demonstration activities all over the country.

ENERGY AWARENESS HAS BEEN CREATED

The DNES should also be credited with creating an awareness about the energy problem and an interest in renewable energy sources by sponsoring a number of seminars and workshops at universities and institutions.

The usual rejection of proposals for substituting conventional energy sources with non-conventional ones, even on a minute scale, is being slowly replaced by an admission of the demand for a fair trial.

Amongst proponents of nuclear power it is still considered 'fashionable' to talk about solar and wind energy. But now the power industry sector, almost as a matter of obligation cultivated through repeated requests, is incorporating non-conventional energy development programmes in their planning schedules.

Thus, Bharat Heavy Electricals Limited, have now gone into the production of solar photovoltaic cells and a section of their Research and Development wing is working on wind generators. Other major public sector undertakings are,

again under instruction from Government, adopting villages for the implementation of renewable energy programmes.

A number of 'urja-grams' have been developed - villages with autonomous energy supplies based on renewable sources. It is proposed to develop more such villages in different geographical areas as models. These trials are no doubt expensive but, the evolution of an adequate model calls for such experimentation.

However, because of limited funding for the DNES and inadequate support from other agencies, the programmes are yet to take off. The DNES has set up five wind farms in the coastal states for demonstration purposes. They are using imported machines and the installations vary between 550kW and 1.5MW. The Department is supporting, through subsidies, the popularisation of solar cookers and collectors, photovoltaic panels and pumps for micro-irrigation purposes, and also wind-pumps.

SOLAR STREET LIGHTS

The Rural Electrification Corporation of India, a Government undertaking, is also providing a large number of solar 'stand-alone' street lights into village electrification programmes and several thousand have already been installed. But the maintenance of the system, especially the battery and electronic convertor in remote villages, is a problem without an easy solution.

Energy Development Agencies have been set up in the different states to look into local needs and problems. The implementation of national programmes through the utilisation of local



Solar-powered water pump

resources is the primary task of these agencies.

Research and Development in the field of renewable energy sources is yet to gather wind into its sails because of the acute paucity of Government funds allotted to it. In the sixth five year plan (1980-85), R&D allocation in atomic energy was Rs 5,330 million against renewable energy's Rs 76 million. Actual figures for the current plan are unavailable because of frequent revision, but it is expected that the renewables' share will be increased.

WIND AND PHOTOVOLTAIC DEVELOPMENTS

Private sector industries, slowly appreciating the potential market for renewable energy devices, are showing signs of participation, although on a minor scale. If funds are available wind generator installations by 1990 will reach, according to plans, a capacity of 25MW. A Wind Energy Research Centre is planned to be set up with Danish collaboration in the state of Karnataka. Wind mapping of several states has also been taken up.

The annual production of photovoltaic cells by two public sector undertakings is presently in the range of 1MW. It will surely rise in the coming years, but no dramatic growth is contemplated. Photovoltaic technology, once again, is mostly imported. Despite the fact that good



Water pump capable of being worked by children

quality research is being carried out in the development of low cost solar cells at different institutions there is a lack in the promotion of a commercialisation process.

Indications in the international field do not encourage such efforts, perhaps. But pilot production of Cadmium/Tellurium, Cadmium/Sulphur, Gallium/Arsenic and other cells for field trials would have led to accelerated developments of indigenous knowledge in this area.

However, in the bio-gas development programme considerable success has been achieved. About 150,000 bio-gas plants are being installed every year and the total number of family-sized plants in India is now above 800,000. It is claimed that nearly three million tonnes of wood is saved every year. Fuel wood scarcity is reaching such a level that the country is planning to import fuel wood from the Soviet Union. These units are becoming more and more popular in rural areas because of the increasing price and low availability of domestic fuels.

The Indian Ministry of Human Resources and Development (Education), in their own effort to develop employment in the field of energy, last year identified four engineering and technology academic units: two in northern India, one in eastern India and the other in the south, as exclusive training centres in energy. The four centres have each been assigned a special area: bio-mass, mini/micro hydro-electric, integrated energy systems, and energy conservation. More such centres are being planned.

The demand for specially trained people is not totally absent but it is still not large enough to attract more young people to specialise in the field. However, given the usual lead time, the introduction of energy technology courses at the under-graduate and post-graduate levels is now being considered as a wise step. But keeping in mind the low per capita energy consumption and the staggering population of India, efforts in the development of alternative energy sources to mitigate the rural energy problems still appear amateurish to many concerned.



Wind-powered water pump

SUJAY BASU is Director of the School of Energy Studies at Calcutta's Jadavpur University.

Solar Delight!

Last September, KERR MACGREGOR was fortunate to be able to attend the biennial Solar World Congress organised by the International Solar Energy Society. In this article he picks out some of the highlights from five very full days of lectures, poster presentations, seminars, exhibitions and social events.

Despite cutbacks for solar work in some countries, notably the United States, and the depressing effect of low oil prices, I got the impression that real progress has been made in the last two years in most areas of solar technology.

Solar heating of water is now commonplace in many countries and the technology is reasonably well established. Nevertheless, some notable advances have been made in reducing complexity and cost, for example by eliminating pumps and electronic controllers and integrating collectors and storage tanks into one unit. A newly developed class of materials called 'translucent insulation' has significantly improved the performance of these integrated solar water heaters. The other route to improving cost-effectiveness is to increase collection efficiency and several firms were exhibiting high-efficiency low-loss vacuum tube collectors. They are still rather expensive and I'm not yet convinced that this is the way to go.

Most of the activity and progress in solar heating of buildings has been in 'passive' solar design where the fabric of the building performs the functions of solar collector and heat storage. The most interesting papers described real projects with real people living in solar houses. The main message here is that solar houses work (a 30% to 50% reduction in heating costs is typical) and that people like them - specially those which feature highly glazed extensions to the main buildings (sunspaces). A well designed sunspace provides not only solar heat also solar light and - most importantly - solar delight. I'm convinced they are a winner.

An interesting paper from Scotland (Porteous, Saluja and Holling) reported on one of the biggest solar projects in the UK - a group of 40 local authority houses and flats in Stornoway. Built by the Western Isles Council within normal cost limits, these have performed well in terms of both fuel savings and customer satisfaction. Some delegates in Hamburg expressed surprise that solar heating could work so well in the far North but my own paper (Is North Really Best for Solar Heating of Buildings?) explained, I hope, why the performance of solar systems for heating buildings generally improves with increasing latitude.

The reason for this rather surprising conclusion is that the longer heating season in the North allows a substantially higher proportion of the available annual solar energy to be used for

saving fuel than in the South. Put simply, ten months of Shetland sunshine is worth more gallons of oil or kilowatt-hours of electricity than two months of Sicilian sun.

Translucent insulation materials can also be applied to passive solar buildings and I was delighted to hear of an exciting new solar proposal in Glasgow - a student residence for the University of Strathclyde which will have the whole southern facade clad with a newly developed type of translucent insulation which lets sunlight in but stops heat getting out.

Steady advances in the technology of converting solar energy directly to electricity (photovoltaics) were reported. Costs are falling fast, conversion efficiencies are slowly increasing and worldwide production panels is growing by almost 30% per annum. As the markets increase, production costs will continue to fall leading to further market growth. I believe that photovoltaics could be competitive with so-called conventional power sources such as nuclear and coal for the large scale production of electricity in the sunnier countries of the world by the end of this century - a very exciting prospect.



Photo: Kerr MacGregor
Solar Houses at Fairmilehead in Edinburgh, using both passive and active water and space heating.

The technology of solar thermal electricity, where solar energy is converted to high temperature heat to raise steam and drive generators, is also advancing with the development of lower cost mirrors using thin aluminised plastic membranes which are vacuum stretched into precise geometrical

shapes. One Israeli firm is now manufacturing and installing solar thermal electric power stations on a fully commercial basis.

At present, oil prices are low but that cannot last forever. Within a generation the world's reserves of oil and gas will be virtually depleted while the environmental problems associated with coal and nuclear fission power continue to increase. Nuclear fusion - virtually the creation of a miniature sun on the earth - remains elusive. In the meantime, clean and inexhaustible solar energy from our nearest star continues to fall on this planet at about 100,000 the rate at which mankind uses energy. The Hamburg Solar World Congress showed that the technology for tapping that vast flow of energy for our future survival is making real progress and I felt privileged to be able to attend and contribute to this exciting and important event.

KERR MACGREGOR is the Chairperson of the Scottish Solar Energy Society

Winds of Change

At a well managed event at the CEEB's London headquarters on 23 March, Michael Spicer, the Minister responsible for Renewable Energy, and the Chairman of the CEEB, Lord Marshall, announced the intention to build over 30MW of wind power plant throughout the UK. It caught the attention of the national news media. JOHN TWIDELL was there. In this article he asks whether this is a serious commitment?

Although 23 March was a significant day for UK electricity generation, it is worth considering the background to the wind farm announcement before assessing the commitment of the Central Electricity Generating Board (CEGB) and the Government.

Wind energy was not of prime interest to the UK Department of Energy when they first investigated alternatives after the 1973 oil crisis. The Chief Scientist for the Department at that time was Walter Marshall, who master-minded Britain's rather lame investigations into renewable energy.

Attitudes were different elsewhere, particularly in Denmark and California where wind energy made rapid strides. Thus by 1988 Denmark had about 1,500 modern wind turbines at home and had exported three times as many. An industry of about 20 companies had become of national significance, and in 1986 a national programme for wind farms, involving groups of large machines, was initiated by the Danish government.

In California by 1986 there were over 17,000 machines with a total installed capacity of over 1,500MW, mostly grouped in 3 areas of commercial (private) wind farms. The average capacity of new machines had risen from an initial 20kW to about 200kW. Significant government assistance and tax credits obviously encouraged the industry, but these ceased in 1988 leaving the companies to continue at a reduced, but still significant scale.

BRITISH WIND ENERGY EXPERIENCE

In the UK, the British Wind Energy Association was founded in 1978 with Dr Peter Musgrove as the first Chairman. With a mixed composition of academics and commercial developers,

they have lobbied strongly for more commitment to wind power. In response to the now undeniable economic and environmental attractions of wind turbine generators, the British government have supported development machines and have encouraged overseas exports. Wind power has become the top 'alternative' for electricity generation, and is now to receive even more support.

There are 3 major UK companies producing machines of interest for utility grid power generation. These are:

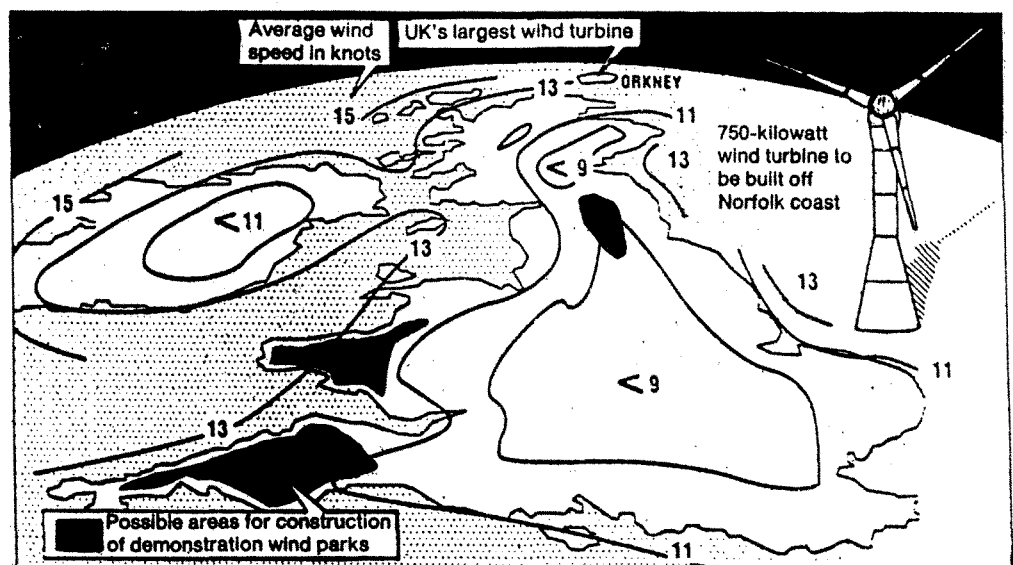
The Wind Energy Group, led by Taylor Woodrow with British Aerospace. They built the 250kW and 3MW government-aided machines on Burgar Hill in Orkney. They have also placed a 200kW machine in North Devon, and have installed 20 similar machines on a 4MW wind farm in California.

James Howden & Co Ltd. With their own resources this Glasgow-based company built a 300kW wind turbine for Burgar Hill, and then proceeded to sell and install a further 80 machines in California. Most of these were for wind farms belonging to a Howden subsidiary in America, selling electricity to the local Californian utility. Howden who have also built one 300kW machine for the CEEB at Carmarthen Bay, South Wales, are now installing a 750kW machine for the North of Scotland Hydro-Electric Board (NSHEB) on Shetland, and are designing a 1MW turbine for the CEEB at Richborough in Kent.

Sir Robert McAlpine & Co Ltd. With government support, this Company have developed the Musgrove vertical axis design. Hopes are for very large 4MW machines placed at sea where winds are strong and the environment largely unaffected. So far the largest machines are 3 of 100 kW capacity, operating at Carmarthen Bay, the Scilly Isles and in Italy.

THE CEEB WIND FARM ANNOUNCEMENT

The CEEB themselves have very little operating experience of wind turbines; most UK experience has been gained by the NSHEB. However trials at



The sites under discussion for wind parks - North Pennines, West Wales & South-West England

Carmarthen Bay, and knowledge of the Danish and Californian wind farms has encouraged this next step. In England and Wales there are to be 4 separate developments.

Most commitment will be for 3 wind farms, each with about 10MW capacity. The general areas specified for these are one in each of the North East and South West of England, and in South Wales. The Board have scouted for possible sites, having both strong winds and spacial separation from housing. After the general announcement, detailed planning procedures will have to be followed for the exact sites.

Each wind farm ('park' is the CEEB's preferred term) will have 25 turbines with rotor diameters of about 30 metres and tower heights likewise of about 30 metres. We can expect the turbines to be in arrays with perhaps 5 rows of machines arranged to face the prevailing winds. The space between the turbine towers will be available for normal agriculture or grazing, with the turbines acting as wind breaks.

Companies will tender for the contracts, but with the Department of Energy giving 50% of the cost, there will be a definite policy to encourage a range of UK companies. Nevertheless the CEEB will insist that the development is cost effective for its part of the funding. For their part, both the BWEA and industry are confident of providing machines generating at 3 pence per kilowatt hour utility cost. This is considered to be the same total cost as producing electricity by nuclear and coal in an environmentally conscious manner.

The cost equation is not simple, however. The advantages of wind are that the equipment is ordered and operating in a short time, and there is no chemical pollution. Disadvantages are the lack of knowledge of machine lifetime, and uncertainties about the public response to aesthetics and noise.

FUTURE DEVELOPMENTS

The fourth development is in cooperation with the Eastern Electricity Board (of East Anglia). A 750kW horizontal axis Howden turbine will be placed 5km offshore in the North Sea. This is to

be the world's first prototype of a large machine placed 'at sea' as distinct from 'near shore'. Costs will be high because of the foundations and marine environment. Access may be by helicopter landing on the top of the machine nacelle.

The Minister announced that "at least one wind park" will be in Scotland; the details are yet to be announced. As compared with the CEEB, the Scottish Boards together have a great over-capacity of generating plant. In addition they are totally engrossed in planning their privatisation. It might be inferred therefore that they have not rushed to have a wind farm.

It appears that one or two wind farms of about 25MW capacity may be planned between private consortia and the Department of Energy. The farms would sell electricity to the grid as private ventures. The obvious need and opportunity is on the diesel areas of the Western Isles (South and North Uist are obvious opportunities for wind turbines) and of Shetland. South West mainland Scotland is another attractive area for developments close to industrial manufacture.

CHALLENGE TO THE PUBLIC & INDUSTRY

Perhaps the best way to interpret the wind farm announcement is as a challenge from the CEEB and the Department of Energy to the wind turbine industry and to the public. Industry has an offer for £40 million of equipment and investment. The public have the opportunity to judge the environmental acceptability of major wind turbine generating plant in arrays spread 2km by 2km across moorland or agricultural farmland.

The Electricity Boards themselves are probably neutral in their opinion, and there is no evidence of any change by the Government or the Boards in their general enthusiasm for nuclear power. Obviously if the present offer for wind power fails, their enthusiasm for nuclear power will be even greater. This is therefore an opportunity not to be wasted.

JOHN TWIDELL is Head of the Energy Studies Unit at Strathclyde University.

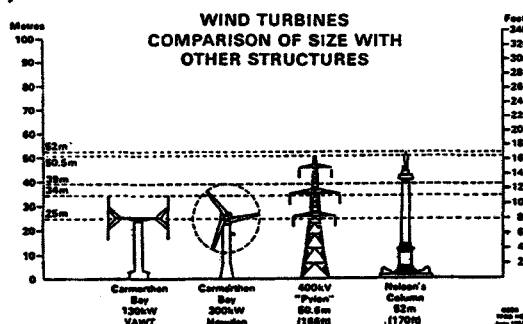
Sites announced

The CEEB have announced two of the three prospective wind park sites: one near Cold Northcott in Cornwall and the other near Capel Cynon in Dyfed, Wales; and expect to announce the final site in the North Pennines shortly.

The 'parks' will consist of 25 wind turbines, each rated between 300kW and 500kW, and will have a total capacity of 8MW, enough to provide electricity for about 5,000 people.

If the results of detailed site studies prove

satisfactory the Board hope to apply for building consent within a year, and commission them between 1990 and 1992.



One of the Board's main concerns is public acceptance. They will be holding full consultations with local authorities, landowners, statutory bodies and other interested parties. They will examine "the regional and environmental implications" of the projects.

Lord Marshall commented, if all goes well "there is the hope that wind could give the country some 1,000MW of economic electricity early next century."

Geothermal

The Department of Energy have announced a further £8.3 million funding for their geothermal, hot dry rock (HDR), research development and demonstration programme (RD&D).

The funds, to be spent over the next three years, will go mainly to the Camborne School of Mines, enabling them to continue work on their existing reservoir at Rosemanowes. The project is intended to reduce uncertainties "with the creation and operation of commercial deep systems."

Energy Minister Michael Spicer, who made the announcement in response to a Parliamentary Question, said the decision "could not have come at a more opportune time, when privatisation of the electricity industry enhances the prospects for renewable sources of energy contributing

to the nation's energy needs." He added, "The current phase of work here at Camborne has identified a potential resource of between 750 and 3,000 TWh - enough to maintain electricity supplies for the South West into the foreseeable future, if it can be fully exploited."

Success in this 'next phase' would lead to a decision being made on "whether or not to proceed to a prototype of a commercial system, at a depth of 6 to 7km." The cost of a 6MW prototype would be about £40 million according to Roger Parker, the project director.

The DoEn's current programme focuses on the potential of HDR for electricity generation only. They believe the use of HDR in combined heat and power or district heating schemes is "economically unattractive."

HDR stations involve extracting heat from impermeable rocks by circulating water

through regions of artificially stimulated fissures. The water is pumped around a closed circuit between the hot rock mass (at a depth of several kilometres) and heat exchangers at the surface. Inducing artificial permeability in the rock is the main technical obstacle to full scale exploitation, and it is on this the Rosemanowes project will concentrate.

The main reason for choosing the Cornish site is that granite gives a higher than average heat flow in igneous rock. Heat is also generated by the natural decay of uranium, thorium and potassium in the granite - which more than doubles the heat flow.

HDR technology's large export potential has not gone unobserved by the DoEn, who note that "the continuing of UK leadership in the field could provide a sound basis for export of technology or management of turnkey projects."

Solar

Solar energy research has received a £3 million cash injection from the Government. Energy Minister Michael Spicer said, "The research will encourage wider use of solar features as part of energy efficient design in buildings."

He spoke of the Government's desire to not only save considerable amounts of money but to improve "the quality of life in both the home and the workplace."

The new programme will promote "passive solar design and cost effective energy efficiency measures." Among the many obstacles facing the commercial exploitation of passive solar energy is apathy. The Department of Energy (DoEn) believe, "If solar technology and energy efficiency good practice are to make the contribution to Britain's economy they should, the construction industry, its clients, and the general public will need to be convinced that the benefits are real." However other nations, like the US, have given the obvious benefits of solar design a helping hand by offering tax incentives, and training sessions for the construction industry.

Incidental solar gains and natural daylight make a contribution to the heating and lighting of all buildings. Pas-

sive solar design seeks to maximise this contribution and, where appropriate, to use solar gains to drive natural ventilation.

Information dissemination and technology demonstration work worth £1.38 million will be undertaken by two teams, working by the same methodology - University of Wales Institute for Science and Technology, and Databuild Ltd. The other major chunk of the Government funds, £1.24 million, is going to CAP Scientific and Oscar Fabers Consulting Engineers to work on computer simulation - to analyse and assess the thermal performance of building designs and specific design features. They will offer a performance analysis service. A £300,000 domestic design study will be carried out by Newcastle University.

Typically, a package of energy efficiency measures costing under £500 can reduce heating bills by 40% compared to a conventional house built to 1982 building regulations.

Active solar energy projects, on the other hand, are no longer receiving DoEn funding; they believe the direct conversion of solar radiation into electricity offers "little prospect of making an economic contribution to UK energy supplies."

Research funds

Despite the recent spate of misleading Government announcements promoting increased funding for alternative energy research and development, totalling over £40 million, all in the garden is not rosy.

The projects announced cover several years. In reply to a PQ from Alister Darling, Michael Spicer gave the figures below.

	£ million
1980-81	15.73
1981-82	22.12
1982-83	16.94
1983-84	12.89
1984-85	15.29
1985-86	13.08
1986-87	11.60
1987-88	13.10
1988-89	12.60
1989-90	12.10

¹ Provision.
² Figures for 1988-89 and 1989-90 are taken from the "Government's Expenditure Plans 1987/88-1989/90" (January 1987). The provision for these years has been revised upwards and will be published in the 1988 public expenditure White Paper.

It must be recognised that no grants are available for full scale projects, or industries and the public wishing to use renewable energy. According to Spicer, "The renewable technologies would not be best served in the long term by distorting the market by grant aid or other subsidies."

The Government's so-called commitment to renewable energy is no more than a PR exercise. Renewables funding is not significantly increasing but is just keeping up with inflation.

Lead cities

Proposals to build a city-wide combined heat and power (CHP) system in Belfast appear to have come to an unsatisfactory end. The Department of Energy (DoEn) have told The Belfast Joint Venture for CHP that they will receive no further Government funding.

Almost exactly four years after the Government announced it would be funding three 'lead city' feasibility studies, into the prospects for CHP/DH, Joint Venture have published a summary of their findings. In reply, the DoEn reissued the statement they gave the Edinburgh CHP Consortium: "It is the Government's long standing policy that CHP should be taken forward by the private sector."

Due to uncertainties in market penetration - the number of people willing to convert to district heating - and a private sector discount rate of only 13%, the consortium believe that "some support would be needed from the Government or supranational sources to take a substantial part of the risk."

The Chairman of Joint Ven-

ture, Emeritus Professor Bernard Crossland, told SCRAM that they are unsure exactly where to take the proposal now: "It is very difficult to see what one does when the Minister says no!"

He believes that in the context of the worsening fuel situation the Government are being "shortsighted."

The scheme would provide district heating for central Belfast, covering about one third of the city. Although many small subsidiary heat sources could be used in the network, it is envisaged that the core of the scheme would be a large power station. The study assumed that this source would be part of the replacement generating capacity required in Northern Ireland by the turn of the century.

Interestingly, Joint Venture believe the new capacity will be the proposed 450MW lignite fired power station at Crumlin. An other option being considered by the DoEn is a second unit at Kilroot - favoured by Northern Ireland Electricity. The report stresses that if this is the case "the principle is much the same."

Apart from the obvious environmental benefits of CHP, the

report highlights the significant employment opportunities of the scheme. About 36,400 person years of work would be generated over 25 years, much of which would be "locally recruited."

● Of the original 3 'lead cities', only Leicester remains a going concern. As Leicester Energy (SCRAM 64), they have just received planning permission for their proposal and intend to start construction work early next year. If all goes well the scheme will start delivering heat in 1992.

A spokesperson for the group told SCRAM that unlike Edinburgh and Belfast they do not require underwriting by the Government, mainly because in their case market penetration is not a problem - there is a high density of industry to which they can sell their heat.

Currently a series of "heat sales negotiations are being conducted with potential major consumers, about 50 in total." Several 'letters of intent' to purchase heat have already been secured, and they are hoping for several more before September, when they hope to raise the capital for the project.

Acid rain

European Community plans to combat acid rain have again been thwarted by the British Government - bringing the European Year of the Environment to an embarrassing conclusion.

It was suggested the UK should cut their sulphur dioxide emissions by 25% in 1993, compared to their 1980 level, by 43% in 1998 and 60% in 2003.

Negotiations collapsed when Lord Caithness, Junior Energy Minister, refused to discuss the matter until power station threshold ratings - the limit at which the incorporation of desulphurisation equipment is required - is increased from 50MW to 100MW.

His argument centred on the cost of the suggested programme, claiming "We are spending £1 billion a year on existing power stations and we want to make sure Europe makes a similar effort to us ... Clearly they are not doing so, as they have low sulphur coal unlike Britain." (sic)

Suggested links between the impending electricity industry privatisation and the Government's refusal to sign the deal were denied. He went on to add, "The future of the British coal industry is at stake, as it would cost a fortune to fall in line with Common Market plans."

European Ministers are furious. Stanley Clinton Davies, EEC Commissioner for the Environment, plainly accusing the British government, said "Those who refuse the necessary action to clean up Europe's air pollution are failing our continent and its future generations."



CHP

Three year old plans for a CHP plant near Basildon are being reviewed by the Eastern Electricity Board following the White Paper on Privatising the Electricity Industry.

Bill Watson, EEB's Director of Engineering, told SCRAM the original proposal was to use coal-fired boilers, but they now believe oil or gas may offer better prospects.

EEB claim the new situation, and changes in fuel prices, could make the scheme viable. However it is more likely that the recent abolition of legislation governing the use of oil and gas in plant rated 10MW or under (SCRAM 64) has prompted the re-evaluation. The proposal is for a plant with a 10MW electrical and 60MW heat rating.

They are also discussing the possibility of building a coal fired power station near London: "In our new contemplative role - in anticipation of privatisation - we are looking at a number of different options."

Wave

The world's first contract for a commercial wave power station has been signed by Norway and Indonesia. The station will be built on Bali, at no cost to the islanders.

The Norwegians will pay about £2.8m for the LMW station, and will retain the income from electricity sales for the first four years. Ownership will then transfer to Bali. They will have inherited a power station which runs on free fuel.

The Managing Director of Norwave, the small company who made the deal, Dr Per Anderssen said that at this stage they were aiming the device at islands and coastal communities who are not connected to a grid, and dependent on diesel fuel. He cites Lord Howe island off the east coast of Australia, where the electricity costs around 25p a unit: "They are shipping in diesel in barrels and they don't know what to do with the empty barrels."

Norwave calculate wave electricity for Bali will cost between 3.5p and 4p a unit. However, they intend to sell it for 9p/kWh - less than islanders pay at present - to make a profit over 4 years. The normal payback time is ten years, which would allow a utility to charge the lower price.

They plan to offer the device to any coast where there is a suitable wave climate and topography. They will fix the initial electricity price at around 85% of the existing price: everyone makes a gain, even at the outset.

Norwave were set up 2 years ago specifically to develop the wave power device known as TAPCHAN (SCRAM 51). It requires a shore line with a sheer cliff - without a shelving beach. The waves enter a concrete sloping channel at the shore and are forced to mount the slope, accelerating as the channel narrows (TAPERed CHANnel). The waves are forced into a reservoir, from which the water is released in accordance with electricity demand, through a turbine coupled to a generator, into the sea.

Much of the skill lies in choosing the right site, where the waves are most fruitful, and calculating the correct configuration for the slope.

Anderssen said "We are only Mark 2 or Mark 3," referring to improvements that have been made at their demonstration plant near Bergen. "We are not yet ready for large power stations serving a grid." But their objective is to build full-scale power units offshore as well as on the coast.

They are engaged in discussions with the Portuguese about wave power in the Azores. Two more generators for Indonesia are in the planning stage, and there are discussions about an eventual network of 300-400 stations for isolated islands.

The UK wave power programme was reactivated last year, after a 5 year break which allowed the Norwegians an opportunity to lead the way into world markets. An experimental prototype is being built on the island of Islay in the Inner Hebrides (SCRAM 61).

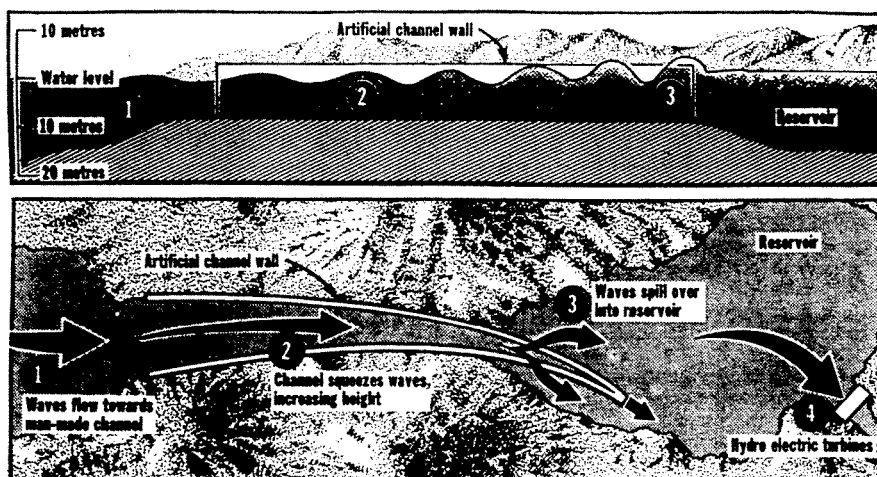


Diagram showing how the TAPCHAN system works in Norway

Biomass

Power, Water and Waste (PWW), a newly formed company, plan to import 2 million tonnes of US rubbish to Cornwall for use in landfill: methane produced will be used to generate cheap electricity for local industry.

The company intend to request planning permission from Cornwall County Council. However the proposal has generated controversy; the council's waste disposal officer is vehemently opposed to the scheme.

PWW intend to use an excavated or existing hole, lined with high density polythene sheets to contain the methane. After a year a series of wells will be sunk to draw off the gas. The 10 acre plot would reach full output of 25MW after 4 years.

The US pay \$120/tonne for waste disposal, whereas the UK pays between £5 and £10/te. Waste will be shipped from the US east coast to a new terminal at Falmouth.

PWW are offering to pay for the power plant, and propose that Carrick District Council meet the running costs. Carrick could sell the electricity, to attract new industry into the area, or to shore up the struggling Wheal Jane tin mine.

The disparity in disposal fees results from tougher US legislation. Household waste landfills require a high density polythene liner. George Pritchard, architect of the proposal, commented, "in this country we only use clay as a liner; in Cornwall they don't even use clay!"

However, as a concession they are willing to take Cornish waste as well. PWW are also considering potential dump sites in Pembrokeshire, Strathclyde and Humberside.

Pollution

International concern about Global Warming has prompted the CEEB to allocate £1.25 million, over the next 5 years, for independent research into the "greenhouse effect."

The studies will include research into the recycling of carbon by marine life; heat transfer from the ocean surface to deeper waters; heat and water vapour from land to the atmosphere; and cloud effects on the climate.

Reviews

Britain's Nuclear Nightmare by James Cutler and Rob Edwards. Sphere, 1988, 200pp, £3.99.

By the use of quotes from victims of nuclear accidents or their surviving relatives, this book unfolds the full horror of the human tragedy behind the cancer statistics.

It is full of anecdotes, which I've already found useful in public speaking: The Merlins' house at Ravenglass near Sellafield, for example, has a kitchen floor more highly contaminated than land in America where house building has been banned.

We discover how people are silenced by the threat of losing their job or by intimidation and harassment. People like Dr Matthews, who was sacked from his soil survey job, sponsored by the Ministry of Agriculture, after a casual chat about radiation on the beach at Seascale. The family he spoke to had spent their annual holiday at Seascale every year for some time. Because they complained to their local Labour Party about the contamination, word eventually got back to his employers. The sad irony is that the family's son contracted lymphatic cancer a few years later.

And Pat Davies who received threatening phone calls, was burgled and beaten up, because of her determination to uncover a link between babies, like her own, born with a cleft palate and hare-lip, and their fathers' work on the nuclear submarine HMS Resolution.

The discharges of radioactivity from Sellafield into the Irish Sea were nothing more than a deliberate experiment which has turned the Ravenglass estuary into the most radioactive area of the world outside Chernobyl and some weapons testing sites.

James Cutler, producer of Yorkshire TV's award winning documentary *Windscale - The Nuclear Laundry* and journalist Rob Edwards, accuse MAFF of failing to realize that plutonium would not be trapped in sediments; failing to control plutonium discharges; and failing to properly monitor pollution.

The Yorkshire TV documentary prompted BNFL to reduce discharges, but the damage has already been done. The accumulated poisons will be finding their way ashore for the next 100,000 years. It also prompted the Black Inquiry, which comes in for some severe criticism from the authors.

But the book doesn't just cover Sellafield - it also includes the story behind Cutler's second documentary *Inside Britain's Bomb* and highlights leukaemia clusters around nuclear weapons establishments.

This is essential reading for everyone concerned with the health of future generations, but you'll need a strong stomach. It's a catalogue of catastrophe, death and deceit. Workers have been killed; the environment has been irrevocably poisoned; and innocent members of the public have suffered from radiation induced cancers.

Buy it and shock yourself into action before it's too late.

PETE ROCHE

**The shocking truth behind
the dangers of nuclear power**

BRITAIN'S NUCLEAR NIGHTMARE



Through interviews with victims of nuclear accidents, interpretations of medical statistics and the acquisition of secret BNFL documents, James Cutler and Rob Edwards have written an in-depth and riveting account of the dangers of the most controversial form of energy yet discovered by man...

BRITAIN'S NUCLEAR NIGHTMARE
James Cutler and Rob Edwards

A brilliantly researched book
NOT TO BE MISSED IN SPHERE PAPERBACK



Best Practicable Environmental Option - Twelfth Report; Royal Commission on Environmental Pollution. HMSO, 70pp, £6.90.

Best Practicable Environmental Option - a new Jerusalem? - Working Group Report; UK Environmental Law Association (Ed. Stephen Tromans). 126pp, £4.85.

"Unless an industrial pollutant can be eliminated as opposed to being transformed, it must be disposed of somewhere" (RCEP). This is the fundamental premise of current environmental legislative thought; and already we run into problems - we don't need simple disposal, we need a consolidated environmental approach searching out the Best Practicable Environmental Option (BPEO).

The BPEO principle made its first official outing in the RCEP's Fifth Report (1976), in which they recommended the creation of "a unified pollution inspectorate with widened responsibilities" - a centrally administered, highly qualified body which would focus on any industrial pollution problem.

The Government's reaction came a mere 7 years later, in the Environment Department's Pollution Paper No 18, which dismissed the concept but recognised the need for a more integrated approach. It received a measure of Government recognition in a 1984 DoE Report which claimed BPEO was "already encompassed in the Government's approach to environmental considerations."

Now 12 years after they first promoted BPEO the RCEP have published a new report, their twelfth. It makes very interesting reading, and defines BPEO as "the outcome of a systematic consultative and decision making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes for a given set of objectives, the option that provides the most benefit or least damage to the environment as a

whole, at acceptable cost, in long term as well as short term."

They believe that, for disposal of a waste stream, consideration of BPEO alone is not sufficient, and that an examination of production processes should also be undertaken to see "whether the waste could be avoided, reduced or its nature modified." Such a legislative assertion would lend itself well to the safe energy cause - an inquiry could be forced to consider alternative non-polluting energy sources as a solution to the major environmental hazards of the nuclear power industry.

The Report also commits itself to the idea of social considerations in promoting BPEO as "not necessarily the cheapest."

A New Jerusalem also advocates the BPEO approach and, when considered with the RCEP report, provides a very strong argument.

It highlights the folly of the bizarre concoction which in this country is referred to as environmental law. Although derisory of the current regime, there is an optimistic air to this volume which, when considered in a historical perspective, is difficult to fathom. Yet we should derive some hope from the UKLA's faith.

The chapters on air pollution, and radioactive waste are of prime concern to the safe energy movement. The latter, by Stephen Tromans, argues that radwaste typifies the need for the BPEO approach, under a single inspectorate. He contends that the Government have already accepted the BPEO in this area, but the complex institutional and legal framework central to the issue make rational strategy and policy formulation nigh on impossible. His premature assertion that "a coherent framework for weighing the disposal options for low and intermediate wastes and for identifying and assessing potential disposal sites is urgently needed", does not detract from the fundamental sense of the volume's thesis.

Both volumes are extremely important, and their conclusions should be taken on board.

MIKE TOWNSLEY

The Star Chernobyl by Julia Voznesenskaya. Quartet, 1988, 181pp, £10.95 (pbk: Methuen £3.95).

"You've got to learn to read between the lines and hear between the words." In her novel, *The Star Chernobyl*, Julia Voznesenskaya has done exactly that; by interweaving the lives of her characters with extracts from the Soviet media, she fleshes out these statements and puts the accident at Chernobyl on a human scale.

The novel is about the attempts of two sisters - Anna, a dissident exiled in Sweden, and Anastasia, a Party member in the Soviet Union - to find out what's happened to their other sister, who lived and worked at Chernobyl. Anastasia's frustration in the face of lies and bureaucracy gradually makes her a dissident too, realising that "they don't give a toss about you and your sister and her kids, they've got their own worries - how can they get out of this business with clean hands and keep people's ears and mouths shut?" and leads her finally to the 'For-

bidden Zone' itself, the ghost town of Chernobyl where a few old people, escaping evacuation, scavenge for irradiated food.

The book highlights the vast scale of the accident and the administrative chaos it produced, and, by its use of conflicting media statements, underlines the impossibility of getting at the facts. The only faint hope it seems to offer is that, like radiation, the truth will finally filter through.

It would be easy to dismiss the incredible 'newspeak' surrounding the accident as a product of the Communist system; but the British Government's vagueness and misinformation regarding Chernobyl, and nuclear power in general, make it obvious that the situation would be similar here should an accident ever occur.

Despite the problem of an appallingly bad translation, Voznesenskaya's book, by exposing the truth in a way which makes it accessible and readable is another weapon in the campaign to ensure that Chernobyl doesn't happen here.

ELIZABETH BURNS

Little Black Rabbit

Little Black Rabbit had a quick peek at the latest Nirex annual report and noticed the company had spent £13.5 million on the abandoned 'shallow grave' disposal sites. LBR got to work with a calculator and discovered this comes to £3.3 million for each Tory seat saved in the dumping constituencies. Will this be set against election expenses?

LBR's cousin on Mull was alarmed to read in the **Torygraph** (found wrapped around some fish and chips), that coal-fired power stations "push out" plutonium. Incredulous, LBR contacted the NRPB to find out the truth. "Funny you should phone us" they said, "we've been waiting for over a week for an alarmed member of the public to query that article."

The truth is, explained the NRPB man, it's not plutonium, but polonium. Surely, mused LBR, this independent body should have told those naughty newspaper people to print a retraction, instead of waiting for me to get in touch.

LBR's Californian cousin was out jogging with a desert tortoise friend last week. During the course of the conversation

it emerged that our friendly shelled reptile is now a "candidate endangered species."

The trouble is: they are unfortunate enough to live in a potential nuclear waste dumping area. The Californians have agreed to relocate them at a cost of \$1 million. LBR believes it would be cheaper and more sensitive to the creatures if the waste was stored at the site of production.

Fred Raymond, Tory chairman of Shepway District Council, won't be getting anymore votes from LBR's friends in Kent. He has infuriated the environmental group, CleanSea, by refusing to ask the Dungeness Community Liaison Committee a few technical questions about the proposed magnox dissolution plant discharges.

In a democratic style in keeping with the 'plutonium state', Cllr Raymond says "I will ask questions which I think are pertinent to the issues involved. We are not required to provide (information) to CleanSea, (who) are closely associated with anti-nuclear societies." He went on to excel himself (and possibly put himself in the bad books of his glorious leader): "We need a nuclear defence and we can't have that without spent nuclear



fuel from power stations."

LBR was waiting at Colwyn Bay Station in North Wales a few weeks ago, when a spent fuel flask went past; being pushed by another train. British Rail: "no danger to the public."

But weren't BR being just a little naughty, especially when spent fuel flasks are plastered with 'No Shunting' signs?

LBR has just finished reading a report from the US, which introduced the concept of electricity utilities offering 'soft loans' for energy conservation measures.

What a wonderful idea! The utilities make more money by striking an economic balance between building expensive new generating plant (to fulfil their statutory obligation to meet electricity demand), and helping consumers to keep the demand down. The consumers use less electricity, so have smaller bills.

After reading the report LBR put the idea to the UK's Eastern Electricity Board. Their reply was less than satisfactory: "Our approach to the use of electricity in industry is such that it is a wise and sensible move to use electricity very widely - many of the countries that are doing well economically use much more electricity than we do. So if it is conservation - we consider conservation of gas and coal by using more electricity, and that way improving the country's economic situation and of course the companies involved."

Emigrating to California may be the cheapest way to conserve energy in the Warren. Which reminded me of the power to contact the Association for Conservation Energy with this rather disturbing information.

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