The Anti-Nuclear & Safe Energy Journal

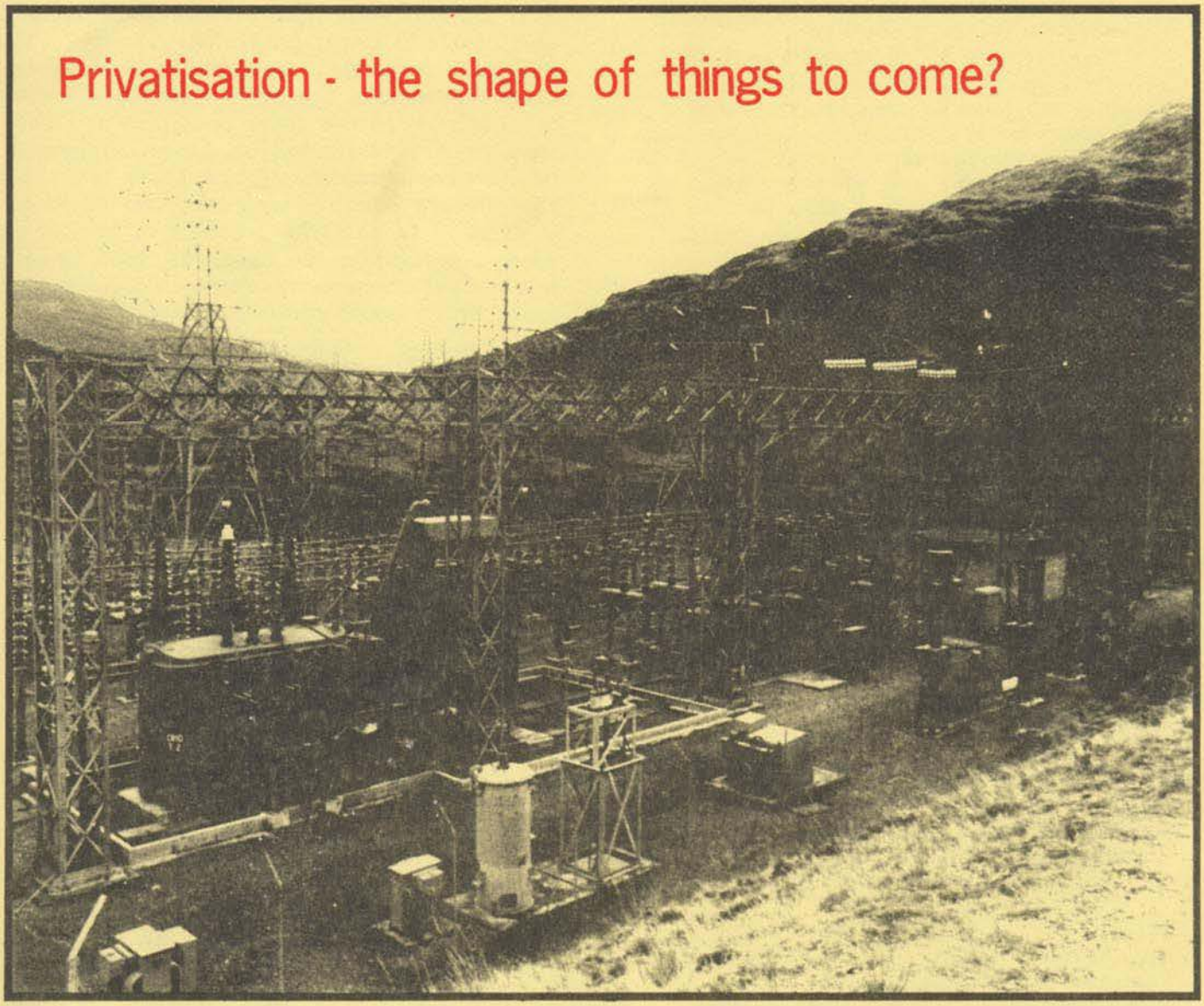
SCRAM

NUCLEAR POWER? NO THANKS

64

60p

Privatisation - the shape of things to come?



CONTENTS

DAVID CROUCH is a researcher at Sussex University's Science Policy Research Unit.
JOS GALLACHER was a Labour candidate in the 1987 General Election.
PATRICK GREEN is FoE's radiation consultant.
DON ARNOTT is a former IAEA consultant and radiation physicist in the health service.
ANDREW WARREN is Director of the Association for the Conservation of Energy.
MARJORIE BROWN is a retired teacher and a freelance writer.

Editor:	Steve Martin
News Editor:	Thom Dibdin
Features Editor:	Pete Roche
AT Editor:	Mike Townsley

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

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

Deadline for the next issue:
Articles (900 words/page), 8 April
News & graphics, 22 April

ISSN 0140 7340 Bi-monthly.

SCRAM, 11 Forth Street, Edinburgh EH1 3LE. Tel: 031 557 4283/4.

COMMENT

After all the official protests, demonstrations, threats of injunctions and school closures, the CEGB's postponement of the Trawsfynydd test raises more questions than it answers.

Initially, the CEGB pointed out that similar tests had been performed at Hunterston (SSEB) and Calderhall (BNFL) - a cynical attempt at damage limitation - but they didn't admit to carrying out tests on their own reactors until after the test was postponed. It now seems that the test, or something similar, has been carried out at each nuclear station during its commissioning phase, and at most subsequently.

It is unlikely that such a test would cause any real problems under controlled conditions, but the older magnoxes, particularly those which have experienced accidents (like Trawsfynydd), are not now in the same condition as when they were first started up. Under prolonged neutron bombardment the concrete and steel containment becomes degraded and could fail if exposed to extreme pressure or temperature. Also, corrosion in the core may lead to blocks in the fuel channels resulting in localised heat spots which could cause fuel cans to burst.

The whole Trawsfynydd event was a public relations meltdown. The public were alerted by plant engineers who 'blew the whistle' because management refused to accept their misgivings. A rumour persists that the experiment was to be more than the CEGB have admitted. The NII accused the CEGB of being "too secretive," yet *they* didn't admit to previous tests.

Local management were resentful of the way the Sudbury House machinery hi-jacked the PR side. It is just possible that they could have defused the situation, particularly if they had allowed independent experts access to all the data well in advance.

But their biggest mistake was to propose to carry out the test before a regular shutdown. Would anyone drive a 23 year old car from Somerset to Caithness just before its 10,000 mile service? They claim that servicing the reactor first, bringing back on stream, then shutting it down for the test would have been too expensive. Cost is not the right argument to convince frightened neighbours, suffering with 300,000 'Chernobyl-ised' sheep.

As a post-script it is interesting to note that a CEGB mouthpiece, when asked why previous tests had not been made public, opined "There was no need to tell people about them. They were pre-Chernobyl."

Hinkley Points!

Energy Secretary, Cecil parkinson, has re-affirmed his view that a privatised electricity industry should be forced to maintain a 20% share of nuclear generating capacity. PETE ROCHE assesses the future for nuclear power under privatisation, and puts it in context of Hinkley C and US developments in energy efficiency.

Cecil Parkinson appears confident that his '20% rule' can be built into a privatisation package, citing diversity of supply as the main justification. In England and Wales the nuclear proportion will reach just over 20% when Heysham 2 is completed at the end of 1989. (It will reach about 60% in Scotland with Torness completed).

So, basically, to fulfill Parkinson's nuclear pledge the new private companies will simply have to replace existing reactors as they are retired. This will involve less nuclear construction than the Central Electricity Generating Board (CEGB) currently have in mind. It is also considerably less than the Tories' 1979 plan to build 10 new Pressurised Water Reactors (PWRs) between '82 and '92.

The 20% plan, therefore, shows just how far nuclear power has fallen out of favour in the last decade. A country with such a low percentage of nuclear power is, for example, unlikely to be seriously interested in fast reactors.

As the Magnox reactors are phased out, Hinkley C would be required towards the beginning of next century and a further PWR about a decade later. This would keep the nuclear percentage at its present level until about 2010 when we would have to start grappling with the problem of Advanced Gas-cooled Reactors (AGRs) coming off line. (Some AGRs perform so badly we would hardly notice the difference!)

The question all potential shareholders must ask themselves is: "if nuclear power is really economic, then why does its market share have to be protected?" This question will have to be answered, not only during the privatisation debate, but also during the forthcoming Hinkley C inquiry.

Sir Frank Layfield made it clear in his Sizewell Inquiry report that his decision was a 'one-off', and that new stations would require their case to be made again in the light of changing circumstances. Since Sizewell much has changed. Chernobyl has put safety back to the top of the agenda. Fossil fuel prices have dropped, making the CEGB's already dubious assumptions about future coal prices look even more far fetched.

The safety issue was not properly scrutinised at the Sizewell Inquiry. Detailed design work was carried out concurrently with and after the end of the inquiry - some of the supporting documents to the pre-construction safety report are still not in the public domain. Promises made to Parliament that the Nuclear Installations Inspectorate (NII) would wish to go to the Inquiry with a clear view on their ability to licence the PWR were broken.

Not only have fuel prices changed in favour of coal since the Sizewell Inquiry, but it has also been alleged that the Department of Energy gave incorrect advice to the Minister. Had the Secretary of State received the correct advice he should have refused consent for Sizewell B and told the CEGB to refurbish the smaller coal-fired stations they has been retiring early, in conjunction with district heating schemes wherever possible.

It is instructive to look at what is happening in other privately-owned utilities around the world. There are very few with plans to substantially increase their nuclear capacity. The most noticeable trend in the USA has been described as "a virtual stampede to make conservation and load management activities a vital part of their operations." In the five years up to 1985 the electricity savings available from efficiency measures doubled, and are estimated to be between 3 and 5 times cheaper than investing in new supply.

Household refrigerators illustrate the enormous potential for savings. It takes the equivalent of 25 nuclear stations (1,000MW each) to power America's houshold refrigerators. Today's most efficient mass produced models use 50-60% less electricity than the average model built 10-15 years ago. Custom built models are available which use 80% less.

The National Appliance Energy Conservation Act, passed in March 1987, established minimum energy efficiency standards for refrigerators, air conditioners, water heaters, clothes washers and driers, dishwashers, direct heating equipment, kitchen ovens, pool heaters and television sets. A study by the American Council for an Energy Efficient Economy estimated that the new standards will reduce electricity demand by 22,000MW by 2000.

Energy efficiency has also been promoted by state regulatory agencies. Before a utility can build a new power station, it must first obtain permission from the Public Utility Commission (PUC). In recent years many PUCs have widened their examination of the need for an investment, and now compare the cost of energy efficiency and other alternatives with the proposed investment.

The Californian PUC has played a leading role in pushing the Californian utilities to the forefront of energy efficiency. Utilities were encouraged in their efforts by being told that the strength of their response would be a major consideration when deciding the rate of return allowed on their assets. Up to 1985 the utilities' conservation and load management programmes had led to a total reduction in demand of 2,726MW, and by 2005 this is expected to reach 13,000MW. California's 1993 refrigerator efficiency standards alone are expected to save the equivalent output of three nuclear stations.

The American experience shows that in the free market, if energy efficiency and nuclear power are compared fairly, efficiency usually wins out. But, it is unrealistic to expect the utilities to take the initiative. However, once given a push by government or their regulatory agency they rapidly learn the value of conservation as a cost-effective tool

RESEARCH BODY	COST	SORT OF MEASURE
National Resource Defense Council	2-2.5c/kwh	Conservation in refrigerators.
American Council for an Energy Efficient Economy	2-5c/kwh	Conservation savings for Pacific Gas & Electric in Residential Sector.
Northwest Power Planning Council	2.4c/kwh	20 year Action Plan.
University of Texas	0.7-4.5c/kwh	Electricity Conservation in Texas.
California Investor owned utilities	0.75c/kwh	Commercial & industrial incentives for installing energy efficient equipment.
Pacific Power & Light	0.47c/kwh	Commercial & Industrial energy audits.

Examples of costs of various conservation measures (The average cost of electricity in the US is 6.3c/kwh. The cost of electricity from a new nuclear reactor is often 10-25c/kwh.)

The priority now for the anti-nuclear movement is to push for the widest possible remit for the Hinkley Inquiry. Coal and energy efficiency are now much stronger competitors than ever before. It is up to us to prove the case for energy efficiency and push the Government into much stronger support for conservation and renewable energy technologies: they should be forced to put their money where their Energy Efficiency Office mouth is, and stand up to the vested interests of the nuclear industry. The alternative is higher electricity prices, increasing fuel poverty, more deaths from hypothermia and a continuing nuclear programme in private hands, with all the fears for safety, secrecy and accountability which it will bring.

Plutonium Flights

BNFL are planning to fly regular consignments of plutonium to Japan from Prestwick airport starting in 1992, despite fears of nuclear accident or terrorist attack.

The plutonium will arise from Japanese spent fuel reprocessed at BNFL's THORP plant. Under the contract, some 45 tonnes will be separated by the end of the century.

About 20 flights a year are expected, each carrying 250kg of plutonium oxide. This will have to be heavily guarded on its journey by road or rail from Sellafield to Prestwick, raising fears that SW Scotland will be turned into a Police State.

George Foulkes, MP for a constituency through which the plutonium will pass is outraged. He points out the Commons Environment Committee recommended in 1986 that "The carriage by air of all except the lowest levels of radioactivity should be prohibited."

George Younger, Defence Secretary, whose Ayr constituency includes Prestwick, told SCRAM that the flights would only go ahead under "the most stringent safety regulations," and "have to be approved by the nuclear inspectorate."

Why Japan should want the plutonium back is not clear, although several reasons have been postulated. It could be used for weapons (which Japan has denied); for Mixed Oxide or Fast Breeder fuel (although the quantities involved seem far too high); or it could be used in a similar way to gold in the International Futures Market - bringing the much feared Plutonium Economy one step closer.

BNFL claim that Prestwick is only one of a "list of possibilities", although SCRAM understand that they have already ruled out Manchester, the other proposed airport.

Opposition to the flights has also come from America. The Governor of Alaska, where the flights are planned to refuel, has filed a lawsuit against the US Federal Government on behalf of the state, because they have not discussed, considered or analysed the environmental impacts of the flights. President Reagan, who regards the flights as "critical" to US national interests has now asked the Defence Department to look at aternative routes.

The questions of flights to Japan arise because of a long-term agreement signed last autumn between Japan and the US, but not yet ratified by the Senate (indeed 2 influential Senate Committees are trying to block this legislation), which gives Japan blanket approval to reprocess and transport nuclear fuel originating in the US. They are the main supplier of fuel for Japan's expanding nuclear power programme. Previous transports had to be approved on a case-by-case basis.

"Plutonium Flights to Japan: an information pack" - available from SCRAM for £1 (inc p&p).

Torness

The Government have refused a request from the Lothian Regional Council to extend the 3 km evacuation zone around Torness to include Dunbar.

At a meeting between the Region and Ian Lang, Scottish Office Minister of State, the Council argued that it is unrealistic to expect the people of Dunbar to sit back if there was an evacuation of Innerwick. Police could be faced with roads blocked by self-evacuees whilst they are trying to take action within the 3 km zone.

Mr Lang said that the chances of an accident extending beyond the existing zone are estimated to be one in a million, although "we do of course have general contingency plans, as for any national emergency."

Councillor Brian Fallon, leader of the Council's deputation, told SCRAM the Council still believe a 10 km zone should be considered before any further commissioning of Torness: "we will continue to lobby for this where and when we can."

The Minister told the council that during an "off site" emergency at Torness, the new Radioactive Incident Monitoring Network (RIMNET) would come into effect. However, the Council point out that they would not have access to it's data (see page 11).

To ameliorate this, the Council raised the question of installing permanent monitoring stations at Innerwick and Dunbar, as well as some sort of public education programme to explain radiation and its possible effects. These are areas on which the Minister was able to agree and the council have subsequently taken them in hand.

● Torness is still not on stream and is unlikely to begin supplying the grid before Easter.

Last October, the Chair of the SSEB, Donald Miller, claimed that Scots could be cooking their Christmas Turkey with electricity from Torness. The SSEB told SCRAM that while all the pre-commissioning tests have been carried out, the Nuclear Installations Inspectorate are still looking at the "paperwork".

Food Irradiation

The Government have bowed to public pressure and shelved, but not abandoned, their plans to allow the irradiation of food.

In a Commons written answer, Edwina Currie, the junior health Minister, said the Government still accepts the advice of its Advisory Committee on Irradiated and Novel Foods (ACINF) that "irradiated food is safe and wholesome."

But because of certain "practical issues" relating to the monitoring and control of irradiated food, Mrs Currie has decided to continue the ban imposed in 1967, until "effective regulatory controls can be drawn up."

ACINF first reported to the Government, recommending that food irradiation be allowed, in April 1986. But the Chernobyl disaster and the revelation by the London Food Commission (LFC) that firms were using irradiation to kill bacteria in contaminated prawns turned public opinion against the process.

In a Marplan opinion poll last year, 93% were against removing the ban, while the Government received 6000 comments on the Committee's 1986 report.

Tony Webb, of the LFC, told SCRAM that although the ACINF report is public, its scientific evidence is not. "There is a considerable body of scientific evidence that suggests there may be cause for concern."

Despite a decision of the European Parliament last year not to give general clearance "on precautionary grounds", the European Commission is currently considering a directive to compel all EEC countries to permit irradiation when the community is "harmonised" in 1992.

News in brief

The final decision on the future of nuclear power in Italy was to have been made in Parliament on 10 February. As is often the way in Italian politics, the Government fell on that day (for other reasons) and a decision was not forthcoming.

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The Philippine Government's dispute with Westinghouse over the mothballed PNPP-1 reactor may end in litigation. The Government are questioning certain payments made to Westinghouse during the reign of President Marcos.

The single largest component of the Philippines foreign debt is an $897m loan from 1975 for PNPP-1.

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The SNR-300 fast breeder reactor which ran out of funds at the end of last year, has had a reprieve. Although it is not started, it costs DM10m a month to keep it viable. The consortium who are responsible for the reactor have now found another DM100m.

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Claims that nuclear fusion could be a 'clean' source of energy have been dashed by a recent report from the NRPB.

The report states that fusion reactors, of the 'tokamak' design currently being developed in several countries, would generate several hundred tonnes of nuclear waste a year. This is equivalent to the waste generated by the current designs of fission reactors.

Hinkley Point

Radioactive contamination, believed to come from irradiated fuel flasks, has been found at the Bridgewater railhead which serves the Hinkley Point nuclear power station in Somerset.

Caesium 137 was found by the Somerset County Council during a county wide background radiation survey. The contamination is at a level of 80,000 bq per kilogram according to the Somerset Regional Analyst. It is concentrated in two small areas under the gantry which transfers flasks from lorries onto trains.

The contamination is causing consternation at the Council. A spokesman told SCRAM that "quite clearly it should not be there, something has gone wrong, therefore somebody has not been doing their job properly."

The CEGB, however, claim that the radiation comes from minute amounts of radioactivity which have "escaped the cleaning process and over the years have dislodged from the flasks at the railhead until their combined radioactivity is detectable."

But the "breakdown in confidence" is not all that alarms the Council. The railhead is close to a school and "kids scramble over the fence, and the gates are often left open for hours on end."

The contamination of the Hinkley flasks is not an isolated event. A confidential 1983 document from a nuclear industry panel of investigation which included the then deputy manager of Hinkley Point, describes the problem as "chronic". It states that it is "fundamentally one of flask design which did not take full account of decontaminability."

Following a meeting with the Council, the CEGB are reviewing their procedures, to "ensure continued protection of the public."

● There are now at least 10,000 objectors to the proposed PWR at Hinkley Point in Somerset, including around 60 local authorities, 11 of them from the Irish Republic.

The massive number of objectors to this application, the first in Britain since Chernobyl, compares with only 4,000 objectors to Sizewell, and has apparently surprised the Department of Energy.

The public inquiry, originally planned to start in May, is now unlikely to start before September. But new obstructions have been put in the way of objectors. Rules just introduced by the Government will give inspectors the power to ban evidence they consider irrelevant or not in the public interest.

Objectors are also concerned that the terms of reference of the inquiry will be limited despite the fact that Sir Frank Layfield's Sizewell Report made it clear that new stations would require their case to be made again in the light of changing circumstances.

LOW-LEVEL RADIATION & HEALTH CONFERENCE

STIRLING '88

4th National Standing Conference on

LOW LEVEL RADIATION AND HEALTH

Stirling District Council have promised maximum support for the 4th National Low Level Radiation and Health Conference to be held in the town on 25th and 26th June.

Conference arrangements should be finalised soon. Already confirmed as convenors for various sessions are campaigning MPs George Foulkes and Frank Cook. Speakers will include Professor Radford, Peter Taylor and Tony Webb as well as Dr Tom Wheldon of COMARE.

Workshop convenors will include regular SCRAM contributors Patrick Green and David Webster, also Jean Emery and Paul Hayward.

The conference is an opportunity to discuss issues from radiation monitoring, to the Government's response to Chernobyl. Genetic effects of radiation, radon gas in houses and health effects of electromagnetic radiation are some of the less well discussed topics which the conference hopes to cover.

See you in Stirling in June!

Contact: Margaret Crankshaw, 20 Reedloch Drive, Barassie, TROON, Ayrshire.

Decommissioning

The Government have refused to direct the CEGB to make changes in the way they account for the cost of decommissioning nuclear reactors, despite a recommendation from the House of Commons Energy Committee.

The Energy Committee recommend, in their March 1987 report on the decommissioning of magnox reactors, the Government to direct the CEGB to change their accounting procedure to include the assumption that nuclear reactors are dismantled 'as soon as technically feasible', ie about 15 years after closure. However, the Government's response, published in January this year, said that, although such a change would have little effect on the cost of new stations, it would cost an extra £200m a year for the next 10 years for existing reactors. This, the Government believe, would lead to present consumers being overcharged

However, the Committee discovered that the CEGB could be storing up problems for future generations. They currently assume that final dismantling of the reactor core will take place 100 years after the station is closed.

The Board assume that money set aside now for decommissioning will grow at a real interest rate of 2% a year, for the next 100 years - a rather dubious method of assessing future costs. If stations have to be dismantled much earlier than expected, there wouldn't be enough money in the bank.

An EEC assessment of magnox reactors was confident that with reasonable maintenance they could remain intact for 50 years - but after that it's not clear what would happen.

Soviet Union

Public pressure in the Soviet Union is forcing the State to cut back its ambitious nuclear power programme, while economists are questioning the assumptions on which the programme is based.

Construction at three reactors has already been halted. Two of these, at Teplodar near Odessa and Dukora near Minsk, were 1000 MW VVER's, designed as combined heat and power plants (CHP). It appears that they were targeted by the environmental movement because of their location near major centres of population.

The third reactor, at Krasnodar near the Black Sea, was also a VVER but designed solely for electricity generation. Opposition from the local government and residents has been given as the reason for abandoning the project on which 25 million Roubles (£25m) had already been spent.

The abandonment of the 3 stations comes at a troubled time for the Soviet electricity industry. Only one third of the production target in the current 5 year plan has been met and the need for more base load stations in Soviet Europe has been questioned.

Further, some Soviet economists point out that the State's plans to emphasise recycling, energy efficiency and conservation, will preclude the need for extra capacity. They point to Western countries, where economic growth is no longer inexorably linked to increased energy use.

The future of three further stations is also said to be in doubt. Two of these, near Voronezh and Gorky, are CHP plant. The third is a massive 4 reactor VVER station at Chyhyryn south of Kiev on the Dnieper river.

Waste Round-up

NIREX

Caithness is emerging as the only place in Scotland where there might be some measure of political support for a nuclear waste repository.

The pro-nuclear Dounreay Action Group, which draws most of its support from the Fast Reactor Research Centre, is considering the best way to put Dounreay forward as a possible site. Local MP and SDP leader Robert MacLennan, has yet to make his position clear. He described a meeting with Tom McInerney, managing director of Nirex, as 'helpful'.

However, opinion in the District is by no means unanimous. Crofters have expressed their total opposition. They believe it would be disastrous for the local farming and tourist industries. Wick Community Councillor, Clair MacLeod, points out that people who might support EDRP may not want a nuclear dump as well.

Highland Regional Council will decide their policy on 22 March. Their planning committee have canvassed views from Dounreay and local anti-nuclear groups.

Geologist Elspeth Reid, told councillors that the geological theory on which "The Way Forward" is based, has not been tested experimentally. There is a lot of frontline research going on at the moment, but Nirex are not waiting for the results.

WEST GERMANY: GORLEBEN

Drums containing nuclear waste in the Gorleben temporary nuclear store are in danger of bursting.

Waste in some drums is oxidising, causing them to bulge. Authorisation of the store expressly prohibits the deposition of gas forming materials.

The 15 drums were only discovered after the Federal investigation into the transnuklear scandal decided to examine every container containing waste processed at Mol.

WEST GERMANY: KONRAD

The West German Federal waste authority, PTB, has agreed to purchase the Konrad iron mine in Lower Saxony for a low/medium level waste dump, despite claims that the mine is unsuitable.

PTB have been examining the 1300m deep mine for almost 11 years. They now believe it to be capable of taking the half a million cubic metres of waste expected to be produced by 2008, with an integrity of 50 to 60 years.

Researchers employed by the nearby city of Salzgitter claim that the quality of PTB's scientific investigations are not up to scratch. One consulting engineer is reported as saying "it wasn't even worthy of a college final exam."

YUGOSLAVIA

Yugoslav plans to study sites in Slovenia for a low/medium level waste store have met with community wide opposition.

At the town of Velenje, near the Austrian border, the mayor has vowed to resign if the local opposition fails. A delegation has been set up to convey the opponent's demands to the Slovenian government.

The opposition is part of a Yugoslav wide anti-nuclear backlash following Chernobyl. Last November, the Government abandoned all plans to build any new nuclear plant before the year 2000, because of popular pressure.

Yugoslavia has one, Westinghouse built nuclear power plant, at Krsko, which is on extended shutdown because of recurring problems with its cooling system.

USA: NEVADA

In a bold attempt to solve the US high-level waste problem (SCRAM 62). Congress have decided to abandon the scientific site selection criteria and plump for a single high-level waste site at Yucca Mountain in Nevada.

Despite the fact that the site is in one corner of the Nuclear Test Site and far from human habitation, Governor Bryan attacked the decision as a "legislative atrocity" that "blatantly rejects the laws of the land" and promised a "nuclear nightmare for Congress and the utility industry." The State will fight in the courts and "through whatever other avenues are needed."

State geologists argue that the site lies near an active fault: there is evidence that a volcanic eruption or earthquake might occur. These fears will have to be addressed during site investigations, and if they turn out to be well founded the whole process will have to begin again.

The decision also requires the Department of Energy to re-examine the need for a Monitorable Retrievable Storage (MRS) facility, and to submit their report by June 1989. Even if the need is confirmed, site selection will have to begin from scratch.

POLAND

Local protests in the Polish town of Miedzyrzec have halted the use of World War 2 bunkers for storing nuclear waste.

The protests started after an indipendent peace group found out about the dump last summer. Up to 4000 of the town's 13000 inhabitants are reported to have attended monthly demonstrations.

Dungeness

A Magnox Dissolution Plant under construction at Dungeness is projected to start operating this April. It has been delayed for over 6 months, because "paperwork for the safety case has taken longer than expected."

The dissolution plant is designed to process metal attachments removed before magnox spent fuel is sent to Sellafield for reprocessing.

This waste is currently stored at power station sites and, according to the CEGB, about 60 tons of the metal is at Dungeness. The CEGB's intended purpose for the dissolution plant is to reduce the waste's volume.

Water and carbon dioxide are passed through the waste, and the resulting contaminated gas vented to the atmosphere. The remaining liquid is then filtered to remove insoluble debris and discharged to the English Channel. The insoluble debris will be stored until Nirex find a disposal site.

The CEGB say the plant will only be operated for 4 or 5 years, as no new waste of this type is being created - since 1976 magnox fuel has not had these attachments. They also claim the greater proportion of the radioactivity will remain in the insoluble sludge: the radioactivity in the discharged liquid should be "little more, measure for measure, than the radioactivity naturally present in ordinary drinking water."

Local opposition group Clean Sea allege that the Board have not proven the need for the plant. The simplest alternative would be just to leave the waste where it is. They believe the plant is only experimental, and if successful, will be introduced at other magnox sites, which must also have a backlog of fuel attachments.

● Opposition to Dungeness as a site for one of the CEGB's proposed "family" of PWRs has come from nearby Hastings district council.

No formal decision for Dungeness has been taken, but site investigations are being carried out. Dungeness is believed to be high on the CEGB's list of prefered sights, because of the increased electricity demand expected in the South East because of the Channel tunnel.

The council is due to discuss a report on the PWR in the near future. Mr Cook of the environmental health department told SCRAM, "it is fair to say that that the council is opposed to any further proliferation of nuclear power at Dungeness.

Contact: Clean Sea c/o Trevor Denniff "Hilltop", Castle Road, Saltwood, Hythe, Kent, CT21 4QZ.

Dounreay

An independent and publicly funded Commission of Inquiry should be set up to investigate the childhood leukaemia "cluster" near the Dounreay according to the medical objectors at the 1986 EDRP public inquiry.

Responding to the proposed amendments to the inquiry report, they argue that "there can be no excuse to delay the setting up of this Commission to look into this matter which we regard as extremely urgent." They also want the other clusters in Scotland to be included in the investigation.

This follows the acceptance by Sandy Bell, the Reporter at the Inquiry, that "there can be no proof that the observed cluster of leukaemia cases could have arisen by chance" (SCRAM 62). He has also called for more research to be carried out.

Mr Bell has not, however, changed his analysis of the alleged link between radioactive discharges and cancer: for the Thurso cluster to have been caused by discharges from Dounreay, their records would have to have been inaccurate; the NRPB would have to have erred in their assessment of safe doses; or some hitherto undetected radiological cause of the disease should exist.

The Black Report, into clusters around Sellafield, cited the same unlikely parameters for discharge-induced leukaemias. The NRPB have now reduced their dose limits, and it turned out after the Black Report was published that the discharges had indeed been higher than the official records showed.

Objectors urged Mr Bell to delay his recommendations until the report of the Committee on Medical Aspects of Radiation in the Environment (COMARE) was published. COMARE have been investigating the Thurso cluster, and were expected to report by Christmas; the report is not now expected before Easter.

Whilst welcoming Bell's change of mind on the cluster, CADE Shetland have listed four areas in which they are "particularly disappointed" that changes have not been made.

They are disturbed that the "patronising remarks" on the quality of evidence expected at a disallowed Lerwick session were not removed from the report; they "regret" the ruling out of waste disposal from the inquiry; they "cannot accept" that higher levels of discharges can be allowed from coastal sites than from inland sites; and they are "astonished" that Mr Bell hasn't conceded that the application is incomplete without engineering drawings or safety analyses.

Furthermore, the West German ruling that the construction plans for the Wackersdorf reprocessing plant are invalid as they do not "take adequately into account the inevitable radiation risks"; the Italian withdrawal from European collaboration on the fast breeder; and France's continuing technical problems with Superphenix, illustrate the imminent collapse of the collaboration which EDRP is meant to service. Mr Bell should recommend rejecting the application.

Mr Bell's final conclusions and recommendations will be sent to the Scottish Secretary for his decision. This is not expected before May.

Accidents Will Happen...

USA: BROWNS FERRY

Bare wires that touched and shorted out led to a fire at the Browns Ferry-2 BWR last November. The reactor was not operating.

Human error and a violation of procedures have not been ruled out as the root cause of the fire, which lasted over half an hour.

Browns Ferry is notorious for the fire in 1974, which was started by a candle being used to look for air leaks. It caused over $10 million damage.

USA: NORTH ANNA

The tube rupture at North Anna last July (SCRAM 61) has revealed a new failure mechanism in Westinghouse PWRs.

It had previously been thought that tube cracks develop slowly and are detectable before failing, the 'leak-before-break' argument.

According to Westinghouse, another 17 PWRs are susceptible to a similar accident. The US Nuclear Regulatory Commission are reported to have said that, until a further accident occurs, the fault will not be regarded as generic!

USA: PILGRIM

The Pilgrim BWR in Massachusetts, closed for safety reasons since April 1986, suffered six "contamination events" in a 48 hour period last November.

In all, five workers and an area of the plant were contaminated. 300 workers were sent home the following day.

The restart of Pilgrim, scheduled for November '88, is being contested on financial grounds. The plant's owners, Boston Edison, use a 70% capacity factor over the next 20 years to justify restart, while a State public interest group claim that this is unlikely, as the 15 year old reactor's lifetime average is only 50%.

USA: WIPP

The US Waste Isolation Pilot Project (WIPP), for plutonium bearing wastes, may have to be abandoned because of water ingression.

The water comes from an aquifer, pierced when a ventilation shaft to the 1250 foot deep repository was sunk in 1983. According to geologists examining the health and safety aspects of WIPP, the probability of radioactive release to the environment, will be such that the site should not be used.

DOUNREAY

A worker at the Dounreay PFR reprocessing plant received a "significant" dose of radiation to his hand in an accident on 9 December.

Although the worker was wearing full protective clothing and was not directly contaminated, the radiation dose which penetrated his glove was in excess of the safety limit. The accident occurred when two workers were replacing a liquid level measuring probe.

ARGENTINA: EMBALSE

The 600 MW Embalse Heavy Water Reactor in Argentina suffered a primary coolant leak at the end of last year.

Heavy water, leaking at a rate of half a kilo per hour, ends up in the Rio Tercero reservoir. The water is said to contain moderate amounts of tritium.

The leak started last August, but the station's owners were denied a request to shut the reactor down, because of power shortages in Argentina. The leak had still not been mended in January.

Embalse suffered 2 steam generator leaks in 1986, when some 790 kg of heavy water entered the reservoir.

DUNGENESS

One of the Dungeness A reactors leaked 2 tonnes of CO_2 coolant and 400 gallons of lubricating oil when a seal failed on a gas circulator on 25 January.

Although the oil was contained below reactor 2, firemen had to stand by because of its proximity to hot steam pipework.

In a second incident on 1 February, three gas circulators failed completely in one of the reactors after an instrument failure.

JAPAN: HAMAOKA

The Hamaoka BWR in Japan had to shut down on 2 February because a switch to two water pumps burned out.

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Whilst we would like this list of "incidents" to be comprehensive, we do not hear of every accident. Any local information and press cuttings will be gratefully received.

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Radiation: Cost or Benefit?

In SCRAM 63, DAVID CROUCH argued the technical case that the apparent raised incidence of child leukaemia around nuclear power stations could have been caused by radioactive discharges into the environment. In this article he looks at why the NRPB so strongly deny this.

The National Radiological Protection Board (NRPB) maintain their theories and calculations are sufficiently accurate to predict with confidence that known levels of contamination could not be responsible for observed cancer rates. How can this be? How can two plausible 'scientific' arguments reach opposite conclusions?

Such a situation can arise because of the high degree of uncertainty that characterises the sciences of radio-biology and radio-ecology upon which numerical estimates of risk are based. The problem is, of course, that there is uncertainty and debate over the degree of uncertainty and debate!

In putting forward an alternative technical argument, and claiming it to be at least as plausible or even more so than establishment positions, it is also necessary to have answers to the following questions: is there any consistent pattern to the NRPB's pronouncements on radiation risk? Why might the NRPB ignore or deny the uncertainty that underlies their work? And why might they make risk estimates towards the bottom end of the range of possible values?

AS RISKY AS SMOKING

In the first place, the NRPB is a research institution devoted to studying the mechanisms of radiation carcinogenesis in laboratory animals. This circumstance is important because studies reporting risks from radiation higher than those implicit in current safety standards have been predominantly observations on *human* populations, such as nuclear workers, radiology patients, or people living near power stations. Thus in 1980 an author of some of this research expressed his opinion that "the scientific evidence that low-level radiation is a hazard to health is at least as strong as the evidence that cigarette smoking is hazardous to health". Radiobiologists, on the other hand, have generally attacked these epidemiological studies on the basis that they contradict the predictions of their theory.

This controversy scores a deep line through the scientific community. In keeping with their research bias, the NRPB favour estimates of radiation risk at the lower end of the range of contested values. However, the only two scientists on the Board to have made any use of human epidemiology have held a markedly different view of the relative value of the two scientific approaches.

In 1979 G W Dolphin described the NRPB's system of radiation protection as "intellectually satisfying, provided that disbelief in the values of the risk estimates is suspended." J A Reissland reached a similar conclusion: "There is no evidence to disprove the NRPB risk estimates, however, neither is there any evidence to verify them."

So there would appear to be a healthy element of intellectual dissent within the Board. On the question of radiation risk, however, the NRPB pull together as a team. Dissent is actively discouraged. A scientist who resigned from the Board in 1977 in protest at their use of epidemiology described his own experience: "the management were biased towards underestimating radiation risks. My paper on radiation risks was held up over a year because the estimates were higher than the management's preconceived ideas."

EX-WORKERS OMITTED

In response to studies reporting higher radiation risks the NRPB have issued swift and sharp rebuttals. The most important of these studies, that of cancer among nuclear workers at the Hanford plant in Washington, prompted the NRPB to obtain a version of the data and perform their own analysis. They concluded: "The Hanford data are compatible with NRPB predictions, though they are also compatible with a wide range of cancer induction rates."

The most substantial use of human population data by the NRPB has been their efforts to establish a National Registry for Radiation Workers (NRRW), tracking the medical histories of those occupationally at risk. This got off to an embarrassing start for the Board. In 1976 they issued a statistical study of the Windscale (now Sellafield) workforce, claiming that there was no evidence of raised cancer rates. The study, however, omitted all ex-employees - the group most at risk from cancer.

The Royal Commission on Environmental Pollution commented: "It is a common experience in industrial medicine to find that observations limited to the period of employment are biased by a deficiency of deaths from cancer and it is difficult to understand why it has not been possible to carry out a proper study of all radiation workers, whether or not they have ceased employment."

DISSENT NOT TOLERATED

It appears that the exclusion from the report of the data on ex-workers was not an incompetent oversight but a deliberate decision: two leading members of the NRPB argued strongly that a follow-up would be pointless, in absolute contradiction of the Board's own predictions that up to 80% of radiation-induced deaths would be amongst these workers. This enigma only begins to make sense if we assume that the NRPB were so convinced of their own risk estimates that they expected a follow-up would find no extra cancers.

Even more embarrassing for the NRPB, the report included an elementary statistical mistake, which when rectified revealed a significant excess of myeloma (a blood cancer) amongst the Windscale workforce.

In short, the NRPB have adopted consistently low estimates of the risks of radiation exposure, deny uncertainty in their work, dismiss opposing interpretations, publicly contradict their own findings, and do not tolerate dissenting opinions among their own staff. A brief look at the system of radiological protection for which the Board produce their assessments provides some clues as to why this should be the case.

Since the mid-1970s the basis of the NRPB's protection philosophy has been cost-benefit analysis. This involves weighing up the costs (radiation-induced cancers and deformities) against the benefits of power generation. To compare both sides of the equation the Board must represent all factors in the same unit: that is, money. There is no objective method for assigning costs to radiation deaths. The NRPB freely admit that they rely on their own "best judgement" in setting a value for human life.

GROSS SIMPLIFICATIONS

These techniques pose insuperable intellectual problems. The long half-life of some radionuclides means that estimates of exposure have to be made into the far distant future. Predictions of risks to coming generations have no more validity than star-gazing. And how are risks and benefits to be quantified?

Different energy choices give rise to qualitatively different hazards. The NRPB uses such dubious devices as equating a genetic defect with one death, or adding up the years of life lost (rather than deaths) from radiation-induced cancer and comparing them with those lost from accidents while crossing the road or mining coal. As one sceptical NRPB scientist remarked: "It might be argued that using a value for the risk of death in an accident at work as a guide to a value for the acceptable risks from radiation-induced cancer is about as anomalous as using the risk of death from the intake of cheese to estimate the risk of accidental death from chalk."

Moreover, cost-benefit analysis demands a precise estimate of the risk: excessive caution, so the Board maintain, could result in overestimating the risk, which might in turn lead to the choice of

Photo: Greenpeace

Sellafield: the focus for many studies on radiation exposure and cancer incidence

alternative practices more hazardous than those involving radiation. Thus at the Sizewell inquiry in 1984 the NRPB stated that their risk estimates "were derived without applying large safety factors for the sake of protection pure and simple."

This emphasis on precise quantification forces the NRPB to make further gross simplifications just to make their calculations possible. For example, so great are the uncertainties in predicting the long-term behaviour of radioactivity in the environment that virtually nothing can be done to estimate future costs except to ignore them. At the 1977 Windscale inquiry John Dunster, ex-Director of the NRPB, argued precisely this: future costs "*must* have some limit in time, probably of the order of 30 or 50 years, because of the lack of appreciation of the effects of doses in future society." The half-life of plutonium is 24,000 years.

NUCLEAR INDUSTRY IN CRISIS

The NRPB adopt a similar strategy in relation to radiation exposures spread at low levels over a large population. They recommend that there should be a level of "insignificant" harm below which radiation exposures can be left out of any cost-benefit analysis. But there is no absolute level, however small, at which radiation risk to an individual is zero. Thus in the US such an approach has been explicitly rejected because it can result in ignoring massive human costs. On the other hand, it enables low-grade nuclear wastes to be disposed of in the environment without expensive packaging or transportation to the deep ocean.

In 1976 R H Mole, ex-Director of the Medical Research Council Radio-biology Unit, noted the trend in radiological protection and warned: "Throughout the last two decades there seems to have been continuing pressure to complete the construction of a completely comprehensive and internally consistent system of radiation standards in the belief that this was practicable. My personal concern is that tidyness for regulatory reasons may serve to conceal ignorance and confirm complacency."

It seems that Mole's fears have been realised. The system of radiological protection employed by the NRPB is confronted with vast technical problems, which the Board circumvent with sweeping assumptions and simplifications whilst retaining an unrealistic emphasis on precise quantification.

What are the motives behind the NRPB's approach to radiation protection? The nuclear industry is in crisis: nuclear waste is piling up at power stations because no safe disposal routes have been agreed. Noting the urgency of this problem, in 1979 the Department of Environment (DoE) commissioned a report on the control of radioactive waste.

The Committee of top scientists from the nuclear industry and the NRPB concluded: "The international climate is such that it will be necessary to justify any substantial increase in sea disposals with more scientific evidence. We believe that there can be quantitative justification for an increased sea disposal programme and we recommend urgent research to build up a body of *knowledge which will demonstrate this.*" The main features of the NRPB's system of radiological protection are directly exploited in pursuit of this aim: the dumping in the environment of increased volumes of radioactive waste.

PSEUDO-SCIENTIFIC FRAUD

For example, the DoE Committee continued: "We have identified certain instances where existing waste disposal routes are not being used to full effect and where the aim of optimisation of costs and benefits has not been achieved." Cost-benefit analysis is thus used to provide scientific credibility and *justification* for the increased exposure of the population to potentially hazardous environmental radiation.

As regards comparing risks of nuclear power with other means of power generation or with everyday hazards such as smoking, it is hard to understand why the Board jump through such an impossible set of intellectual hoops, unless it is to satisfy the demands of its nuclear sponsors. As British Nuclear Fuels stated at the Sizewell Inquiry in 1985: "In the Company's view it is absolutely essential to the development of the business and potentially to the development of nuclear power that a framework of regulation is established which recognises the very low levels of risk attached to its operations in relation to the risks accepted by society in its other activities." Such comparisons are a pseudo-scientific fraud perpetrated to allay public anxiety.

The links between the NRPB and the nuclear industry are clear. In 1976 the Royal Commission on Environmental Pollution noted with concern that "the NRPB is quite widely identified in the public mind with the nuclear industry" - and quite rightly so. When the Board was founded in 1970, their staff were drawn for the most part from the Medical Research Council. All the top posts, however, were filled from the Atomic Energy Authority! At the time there was a strong feeling amongst the Research Council scientists that the staffing of the NRPB was inappropriate and there was no way that it would establish any independence from the AEA. Some of these scientists consequently resigned.

In sum, like many regulatory organisations before them, the NRPB have been "captured" by their client industry. The dominant scientific ideas about radiation are wedded to the system that they seek to justify. Trade Unions and pressure groups should demand full representation on the various committees responsible for the control of nuclear power and should press for an independent review of the work of the NRPB.

Nuclear Exports Controversy

Commercial competition is undermining a key element of the non-proliferation regime as France and Britain strive to export reprocessing technology. JOS GALLACHER looks at changes in policies agreed in the 1970s.

The 1970s was a decade of high profile in the non-proliferation debate when two American Presidents successfully persuaded European suppliers to limit the spread of plutonium by preventing the export of reprocessing technology. Today some of the controls put in place then are giving way under the pressure of commercial competition.

Only two companies engage in commercial reprocessing and compete to sell their services worldwide. They are Cogema of France and British Nuclear Fuels (BNFL). In the past year competition has taken a new twist as the two companies vie to export technology previously banned by international consensus.

The first blow to the regime was felt in January 1987 when a Cogema subsidiary, SGN, signed a contract to transfer technology to Japan for the Rokkasho Mura reprocessing plant. SGN will provide a plant capable of separating plutonium from 800 tonnes of spent fuel each year.

SENSITIVE TECHNOLOGY

French plans to sell a reprocessing plant to Pakistan in the 1970s was one of the spurs to American moves to halt the spread of the technology. President Ford used the multilateral meetings of the Nuclear Suppliers Group (NSG) to persuade nuclear exporters to restrict the spread of 'sensitive' technology, including reprocessing.

The agreement reached by the NSG in December 1975 reflected American pressure. The exporters agreed to "exercise restraint" in the export of sensitive technology, but kept this secret until 1978, by which time all the principals had agreed a complete ban on the export of reprocessing plants. However in early 1976, when each country individually announced its policy in these terms, the wording was deliberately ambiguous.

French President Gisgard D'Estang was at odds with his Gaullist Prime Minister, Chirac, who feared that US interests might dominate French policy. It was not until December 1976, after Chirac had resigned, that President Giscard announced that France would "discontinue until further notice the export of reprocessing facilities." Even this statement allowed the contract with Pakistan to continue until finally cancelled two years later, under pressure from another US President.

That policy has now been reversed by SGN's contract with Japan.

BNFL have responded to the French breach of the export embargo by launching their own export drive. Unlike Cogema, BNFL do not have a single subsidiary responsible for the design and construction of reprocessing plants. In order to build the Thermal Oxide Reprocessing Plant (THORP) at Sellafield, BNFL awarded contracts to a number of design and engineering companies. In June of last year BNFL announced that they had formed a consortium with these companies which would compete with SGN in the export of reprocessing technology.

EXPORT RESTRAINT

Announcing the consortium, British Nuclear Technology (BNT), BNFL claimed "The network of subsidiary and affiliated companies established throughout the world by the consortium members will help overseas sales."

BNFL are themselves negotiating two contracts for technology associated with reprocessing. One involves the Rokkasho Mura plant for which BNFL will provide evaporator technology. The other contract is to provide solvent extraction technology for W Germany's Wackersdorf reprocessing plant.

Like France, Britain is bound by the NSG agreement. The export restrictions were announced in Parliament by Jim Callaghan, then Foreign Secretary, on 31 March 1976. "We shall also study with particular care proposals for the export of sensitive equipment or technology... which could lead to the construction of uranium enrichment plants, reprocessing plants or heavy water production plants. In general we shall exercise restraint in the export of such plants or their technology." The Foreign Office still regard this as current policy on nuclear exports.

American pressure did not stop with the NSG agreement. When President Carter arrived in the White House he cancelled the US Fast Reactor project and sought to persuade other countries to adopt fuel cycles which would avoid the separation of plutonium.

WEAPONS STATES' MONOPOLY

Britain, however, was planning to build THORP, and to use part of its capacity to reprocess fuel for Japan. Thus Britain would not provide Japan with reprocessing technology or equipment but would provide the services of a plant in Britain.

Dr David Owen defended this position in Parliament in a debate on the Windscale Inquiry. He expanded on the meaning of the NSG agreement. "We shall certainly apply this restraint to the sale of reprocessing plants or technology. We have never made such a sale nor do we intend to do so."

He wished to keep reprocessing out of the hands of States who did not yet possess nuclear weapons. "I am second to none in wishing to restrict reprocessing where possible to those who are nuclear weapon States. The most that we can try to do is to limit the number of additional plants, and we believe that the best way to do this is to remove the incentive for their construction by offering the services of our own expanded plant, particularly to non-nuclear weapon States."

West Germany is today seen as a potential market for reprocessing technology, but in the 1970s it was a potential exporter - despite the fact that they only had a small plant of their own (the 10 tonnes a year Karlsruhe research plant). In June 1975 they signed a contract to supply Brazil with eight nuclear power stations, and pilot enrichment and reprocessing plants.

West Germany, a member of NSG, was bound by the same agreement to exercise restraint. However, they resisted American pressure for a complete ban for six months after France had agreed to discontinue the export of reprocessing technology. On 17 June 1977, following a Franco-German summit meeting, Germany accepted the prohibition in a statement expressed in the same terms as the earlier French policy.

NUCLEAR EXPORTS ECONOMY

The US were able to exert influence over other countries' policies due to their position in the nuclear fuel market. In the 1970s they had a near monopoly on the supply of enriched uranium, and all contracts contained a clause which prevented its reprocessing without prior consent. The US could, therefore prevent the reprocessing trade by denying permission to reprocess most of the world's nuclear fuel.

Last November the US reached an agreement with Japan giving consent to reprocessing, transport and use of plutonium derived from US supplied fuel. Unlike his predecessors, President Reagan has favoured nuclear trade to non-proliferation and believes that "proliferation was none of our business." However most US non-proliferation policy has been codified in laws passed by Congress and the agreement with Japan represents the first real break with the earlier policy.

In the 1970s countries co-operated to establish an international norm against the spread of technology to separate plutonium. That policy has remained in place, in part because it bolsters an imperfect non-proliferation regime, but also because international economy has not generated demand for nuclear exports. That demand has begun to appear and as a result free market ideology and competition between BNFL and Cogema threaten to undermine the principle restraining reprocessing technology.

Unreal Radiation Response

The Government's handling of the lamb bans and the missed hot spot on Skipton Moor demonstrate that they are still not in control of the Chernobyl situation. PATRICK GREEN looks at the claim that they have learnt their lesson, and examines their new monitoring arrangements.

Contrary to Government claims that the response to Chernobyl was adequate, it was an example of bad management, poor decision making, inadequate communication, misleading information and totally inadequate monitoring procedures.

They still dispute that a nuclear accident could occur here and so no changes have been made to existing site emergency plans. However, they do accept that an accident may occur abroad.

In July 1987 the Prime Minister announced the creation of a national radiation monitoring network as part of new contingency plans for nuclear accidents overseas (an admission that such plans did not exist before). The system, known as the Radioactive Incident Monitoring Network (RIMNET), is to have the following purposes:

- Establish the hazard likely to be found in the UK.
- Determine the measures required to protect and/or reassure the public.
- Issue whatever specific directions or information may be required.
- Keep Parliament properly informed.

These are the very functions which the Government failed to fulfill after Chernobyl. The system would be co-ordinated by the Department of the Environment (DoE), and would consist of a network of monitoring stations based on existing facilities supplemented by deploying portable detectors, as well as information available from hospitals, universities, local authorities and organisations with monitoring facilities. The data will be held at a centralised database (CDF) which would communicate with the monitoring stations via electronic mail.

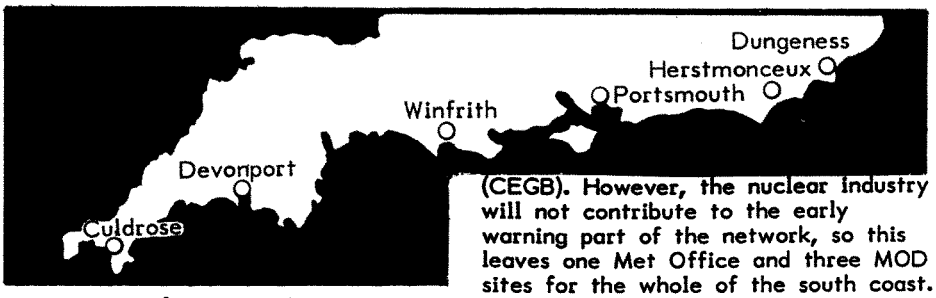
The Prime Minister's announcement was followed by a DoE consultative document and the final details were released in December 1987. At first glance the system sounds impressive: about 80 stations will continuously monitor background dose-rate levels and act as an early warning system; when an alert is sounded monitoring will be supplemented by food and ground deposition monitoring at a number of sites.

The exact location of the 80 sites has yet to be decided; but existing nuclear industry sites, which have some of the most advanced continuous monitoring equipment around, will not be part of the system because of "technical difficulties." Nor will there be a practical role for local authorities.

The system will be introduced in two phases. Phase 1, consisting of gamma dose-rate monitoring equipment, is scheduled to be operating in the first part of 1988, and will be installed at around 40 Met Office sites. These will not be computer linked, so readings will be taken manually and transmitted by staff to their Bracknell headquarters using "existing communication links," ie telephones. Bracknell will pass on the data to the CDF at the DoE.

Phase 2 is the subject of a separate design study, and is still under consideration to "identify gaps in the phase 1 monitoring capability and scope for automating key data collection processes to minimise manual intervention and chances of human error." In other words, phase 1 is far from satisfactory.

Phase 2 is expected to comprise 80 fully automatic gamma dose-rate monitoring sites (stage 1), supplemented by automatic water and deposition measuring stations (stage 2) and the introduction of improved meteorological models for prediction and assessment of dispersion and deposition of airborne activity (stage 3). Nobody knows if the system will work as full testing is not envisaged until stage 3. The DoE expect phase 2 to be fully operational in about two years time.



Many people expected the system to be open-ended, as part of the post-Chernobyl glasnost: any agency with a monitoring capacity which fulfilled the communication protocols, contributing data to the CDF, would be able to access raw data from other stations. This would enable local authorities to rapidly assess the situation and issue appropriate warnings, and would considerably increase the coverage of the network.

However, local authorities they will not have access to raw data; instead Government scientists will analyse the data, determine the situation and tell local authorities if action is needed. The Government clearly want to avoid the public ringing them up for information. Under RIMNET this is a local authority role.

If this sounds familiar it is because nothing much has changed. There is no reason to believe that if the network detects a rise in radiation levels the situation will be any better next time. The only difference will be that summarised data will be available from electronic bulletin boards. Local authorities will still be in the dark.

This of course assumes that the Government are sufficiently organised so that monitoring data arrive for analysis. With automatic systems this should not be a problem, provided the electronics work and data are acted upon when they arrive. For the first two years the system will be manual and down to the Met Office to provide the data. We are asked to believe the introduction of a few computers will dramatically improve the channels of communication between Government agencies. Unfortunately the RIMNET plan isn't clear how this will be done.

The plan contains flow charts to illustrate who should be communicating with whom. But this has always been the case. There is a big difference between what should happen and what actually does. During Chernobyl the DoE demonstrated they could not organise the response to a national emergency, and unless the channels of communication are improved RIMNET may well prove to be a dead duck.

More surprising is the proposed coverage of the monitoring stations. The Met Office prefer a radiation early warning system withstations no more than 100 km apart. For an accident overseas this should mean the south coast is well covered: Culdrose (MOD), Devonport (MOD), Winfrith (UKAEA), Portsmouth (MOD), Hurstmonceux (Met) and Dungeness (CEGB). However, the nuclear industry will not contribute to the early warning part of the network, so this leaves one Met Office and three MOD sites for the whole of the south coast. This cannot be considered adequate.

However you look at the RIMNET proposals they are not adequate. What is needed is a national monitoring network, run by an organisation like the NRPB (in preference to the DoE), which is designed for both accidents overseas and those occurring in the UK and which is open-ended, ie the CDF can be interrogated remotely by local authorities and other agencies with a radiation monitoring capacity.

In addition, regional centres should be established which would serve as a focal point for information flow and advice to the public and the farming community in the event of accidents. This should involve the use of regional bulletin boards which contain regularly updated information. Local authorities, farming organisations, hospitals etc should be provided with direct emergency links with both the regional centres and the NRPB.

Unless such arrangements are made the situation following the next accident won't be any better than after Chernobyl.

Chernobyl Explosion Bombshell

This April is the second anniversary of the Chernobyl accident. STEVE MARTIN and DON ARNOTT assess the evidence which indicates that the explosion which ripped the top off reactor number 4 was in fact a nuclear one. They address the question: could a nuclear explosion happen in a UK reactor?

"A nuclear power station cannot explode like a nuclear bomb." This is one statement from the nuclear industry which critics have accepted. However, this consensus was broken by Chernobyl. It has become clear that the intensely violent explosion which destroyed reactor 4 on 26 April 1986 was triggered by a nuclear explosion, albeit a mere fizzle compared with the force of modern nuclear weaponry.

Many reports, both technical and otherwise, have been published since the accident: the first, by Dr John Gittus, then Director of the UK Atomic Energy Authority's (UKAEA) Safety & Reliability Directorate, appeared in the October 1986 issue of *Atom*, the Authority's house journal.

CAT OUT OF THE BAG

A phrase in Dr Gittus' article caught the attention of independent nuclear experts: the operators "were too late and part of the reactor went prompt-critical." The cat was out of the nuclear bag - a nuclear explosion can occur in a reactor.

In their 'Glossary of Atomic Terms', the UKAEA describe prompt critical as: "The state of achieving criticality in a reactor by means of prompt neutrons alone and therefore *without the control* effected through the delayed neutrons"(emphasis added).

Again according to the UKAEA's Glossary, a prompt neutron is one which is "emitted immediately upon fission", whereas delayed neutrons are "emitted a measureable time after fission" and "play an essential part in nuclear reactor control."

An explosion is an instantaneous, and thus uncontrollable event - a prompt critical excursion, relying on immediately emitted neutrons and taking the reactor out of control, is a *nuclear* explosion.

According to official reports of the accident, four seconds before the explosion the operators pressed the 'panic button' to insert the control rods into the reactor. But these rods are mechanically driven into the core of the RBMK, and this takes time; in this case there was not enough time.

Less than 1½ seconds before the explosion the reactor developed a power surge more than 100 times its maximum rating - the prompt critical excursion. In the explosion the 1000 ton lid of the reactor was blown from the horizontal to the vertical. Was this incredibly violent event the direct consequence of the prompt critical nuclear explosion, or was there some other cause?

Dr Gittus writes, in a follow-up article in June 1987's *Atom:* "In essence the Chernobyl accident was a steam explosion (or rapid evolution of steam) triggered by a prompt critical excursion."

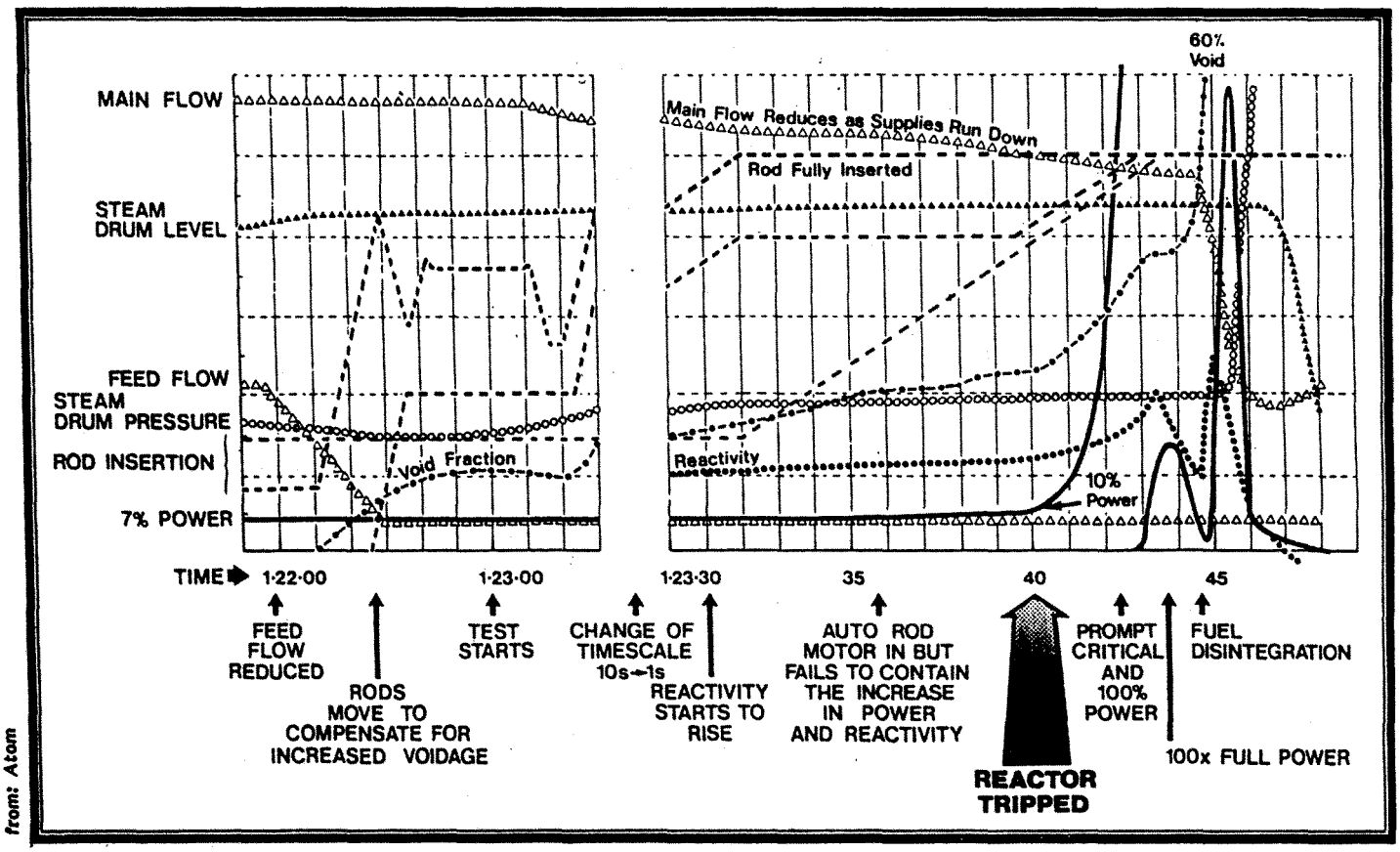
He claims the lid was blown off by the steam explosion. But, it is important to bear in mind that the RBMK containment is not pressurised - it doesn't need to be as generalised cooling is achieved by pumping a nitrogen/helium gas mixture through it at 26 psi, a little less than twice atmospheric pressure, and the 1000 ton lid would keep it gas-tight (only the steam tubes are pressurised).

RBMK NOT PRESSURISED

In a pressurised reactor there would be a gradual build-up of pressure until the vessel couldn't stand it any more, and it would breach in an explosion. At Chernobyl the explosion occurred without a slow pressure build-up; a steam explosion would take much longer to develop, and could not have been so violent, as only part of the core was involved - the lid may have *lifted* but would not have opened like some huge door.

An explosion, as well as being immediate, also releases enormous quantities of heat, vapourising and/or burning whatever is nearby, which in turn causes an (immediate) increase in volume with a consequent rise in pressure. This immediate pressure increase would blow off the lid.

Also, a transient temperature in

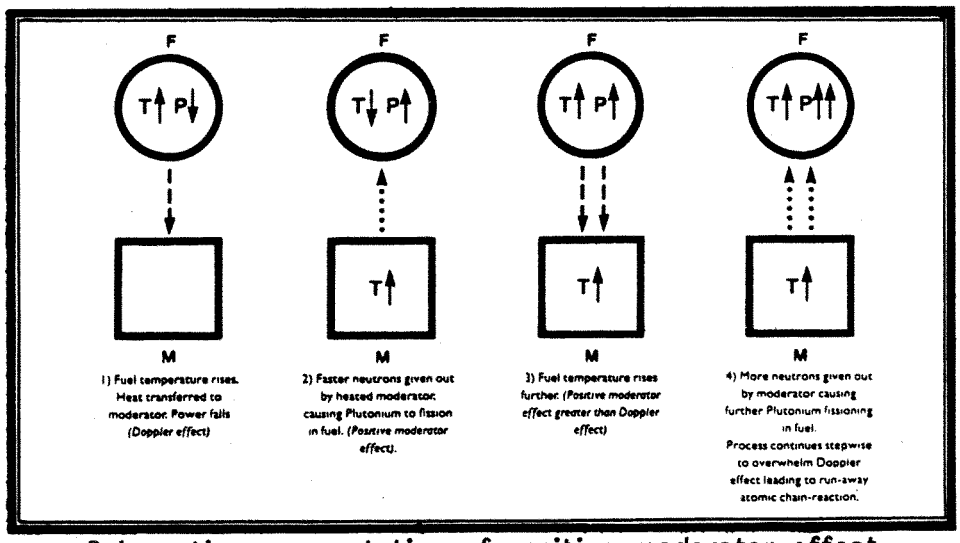


from: Atom

Sequence of events which led to the Chernobyl explosion

excess of 4000°C was experienced, somewhat parallel to that of an atomic bomb's heat flash and much higher than temperatures normally encountered in chemical burning (the zirconium-steam fire at Three Mile Island 'only' reached 1500°C). The much hotter Chernobyl explosion therefore could not have been due to a zirconium-steam fire alone.

Dr Gittus discounts the nuclear explosion theory because this requires "keeping the nucleii close together long enough for millions of fissions to occur very rapidly," and "because dispruption of the core, as occurred at Chernobyl, brings the fission process to an end." But, even nuclear weapon explosions are not 100% efficient; they also 'blow themselves out' before completion.



Schematic representation of positive moderator effect

OPERATOR ERRORS

Is there any other evidence to prove the nuclear explosion theory? The speed of development, and intensity, of the graphite fire after the explosion suggests something unusual must have occurred. Machined and compressed graphite blocks do not burn readily in air, and even if they can be ignited they tend to smoulder (as in the 1957 Windscale fire) rather than blaze like a bonfire.

Also, as a result of the explosion, sizable chunks of debris were flung more than a kilometre into the sky above the plant. A mere steam explosion could not cause such an effect. Another measure of the fire's intensity was the type of radioactive material discovered in fallout in other countries.

The second most abundant isotope in the UK Chernobyl cloud was Tellurium-132. This is less volatile than the front-runner, Iodine-131, and can only be explained by an intense fire. It has a half-life of only 77 hours so, back-tracking to the Ukraine, it would have been the most abundant isotope at the instant of the explosion.

Now, even if the world nuclear industry were to publicly accept it was a nuclear explosion which destroyed Chernobyl, their argument that the RBMK is a poor design and the accident occurred because of operator error still holds. But could it happen elsewhere; in the UK for instance?

Operator error has been the cause of nuclear accidents all over the world, some minor and some, like Three Mile Island and Windscale, major. The USSR does not have the monopoly on complacent or lazy operators. So errors could occur, but would the design of AGRs or PWRs permit such a catastrophic accident if such errors were made? The industry claims that this is impossible because of the defence in depth and inherently safe characteristics of western reactor designs.

Much has been made of a visit to the USSR in 1975 by a British nuclear team to examine the RBMK reactor design. The report of the visit, which incidentally was not officially passed to the Soviets, expressed many reservations. (The report was re-issued by the National Nuclear Corporation in May 1986.) However, one design feature appears to have escaped their notice - the RBMK is water cooled, and the water flows through zircaloy tubes, just as in the Pressurised Water Reactor (PWR).

Zircaloy catches fire in steam, so the reactor contains a built-in fire risk: should cooling fail and heat build up, water will flash into steam which will react with the zircaloy. This was proven at Three Mile Island where the strongly exothermic reaction, ie one which gives off a great deal of heat, was a major contributor to the accident and caused the control rods to melt. At the time of the visit to the USSR the UK were considering buying a PWR, and subsequently did so for Sizewell.

Another risk exists with our AGR and magnox reactors - they have a graphite moderated core like the RBMK. If the coolant is lost through a major break in the circuit, could a prompt critical excursion occur?

COULD IT HAPPEN HERE?

Prompt criticality can depend on several factors; it occurred at Chernobyl because of a characteristic of the reactor design known as *positive void coefficient*. Steam is a poor absorber of neutrons, so if the amount of steam in the fuel channels increases the neutron population rises, extra fissions occur in the fuel, and the reactor power can increase. However, as the power rises so does the heat which has a negative effect on the neutron population - the reactor has a *negative fuel coefficient*.

At normal high power the negative fuel coefficient dominates the positive void coefficient, but at lower power (below 20%) the *void coefficient* can take precedence and a run-away reaction is initiated and the *opposite* sequence occurs: neutron population increases, reactor power rises, heat increases, more steam is produced, neutron population increases. In the case of Chernobyl, the reactor was running at low power, with virtually all of the control rods withdrawn, and the automatic scram systems overridden. It is highly unlikely that such an event could occur with the control rods inserted.

UK graphite moderated reactors, under certain circumstances, demonstrate a positive power moderator coefficient. If all coolant flow is cut off then the reactors are designed so that several back-up systems will come into play in this unlikely situation. However, if all these systems fail the graphite will overheat. A rise in heat increases the rate at which the more abundant, and non-fissile, uranium-238 isotope absorbs neutrons. This has the effect of slowing down the reactor.

But, a rise in temperature also has the effect of increasing the fissioning of plutonium-239 (which is formed by U-238 absorbing neutrons) in the fuel. Depending on the proportion of Pu-239 in the fuel, this reaction can run away and lead to a prompt critical excursion. Young fuel will have less Pu-239 in it, and hence will be less likely to initiate a prompt critical excursion. However, old fuel (and analysis has shown that the Chernobyl fuel was about 2.4 years old) will be more likely to contribute to prompt criticality.

Thus, UK reactors, are not immune to prompt criticality excursions; only the specific Chernobyl sequence is impossible. If back-up systems fail to operate, or are deliberately overridden, and serious faults develop in the cooling circuit, then conditions for an excursion could be created. Pressure vessel embrittlement of some older reactors, due to long-term intense neutron bombardment of the steel, could cause them to give way, spewing the core's radioactive contents across an enormous area. And, in Britain, there is nowhere to run.

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Craigroyston Revisited

In 1980 the NHSEB quietly dropped plans for a controversial pump storage power station at Craigroyston, on Loch Lomond. Now, eight years later with the combined threat of Torness coming on stream 'any day now' and the privatisation of the electricity industry, the proposal could once more haunt the area. MIKE TOWNSLEY outlines the history of the scheme and argues that the initial objections are still valid.

The NSHEB (North of Scotland Hydro Electric Board) have been toying with the idea of building a pump storage scheme on Loch Lomond for many years. The most recent and serious proposal first manifested itself in their Annual Report of 1970/71; it announced initial studies to assess the possibility of a pump storage scheme using Loch Lomond water.

Again, in their 1974/75 Annual Report the scheme popped up under the heading of future supplies. This time it was billed as "the most suitable site for the board's next large pumped storage scheme." This would not only be the "next large pumped storage scheme," but at 3,200MW it would be the largest in Europe, and would represent an increase in the Board's pumped storage potential of over 450%!

It was their intention that once engineering feasibility had been proven, the station would be built in 2 phases, the first having a storage potential of 1,600MW. Careful consideration of the terrain around Loch Lomond indicated to the Board that Craigroyston, on the eastern shore, was "a suitable site" for the scheme.

The storage reservoir would require a rockfill dam (local rock to 'minimise' visual impact), 700m long and 74m high in the upper valley of Cailness (on Ben Lomond), 450m above the level of the Loch. Small subsidiary dams would also be necessary on the ridge between the Loch and the reservoir.

The power station itself would be underground, beneath the Creag a' Bhocain - Ptarmigan ridge, and linked via tunnels to the storage reservoir, and to an inflow/outfall point on Loch Lomond just south of Rowchoish.

DAVID & GOLIATH

Rumours of the Craigroyston scheme had circulated in the local community since the original reference in the 1970/71 Report, but the later Report was enough to convince them that this was indeed a serious threat.

The Drymen Amenity Society, at their 1976 AGM, started the first ripple in a tide of protest. After entering into lengthy correspondence with the Board, the Society realised that if they were going to take up giant-killing they would require more than a local community council sling shot in their armoury.

Amongst those contacted were the Association for the Protection of Rural Scotland, Scottish Wildlife Trust, FoE, Dumbarton and Stirling District Councils, and Strathclyde and Central Regional Councils. Although not all the large organisations were able to decide where they stood on the overall question of the proposal, most disagreed with at least one characteristic of the proposal. Thus the Amenity Society had built an impressive wall of protest, which the Board would find difficult to bulldoze.

The proposal raised many questions.

- Was the capacity required?
- Is this the best site for the next pumped storage development?
- Is pumped storage the answer to increased electricity demand?
- How much protection should areas like Loch Lomondside be given in law?

It is at a Planning Inquiry that objectors get the opportunity to air their opposition. And it was on this topic they decided to make their opening gambit.

RESTRICTED REMIT

The Board's proposal would be made public when they requested the Scottish Secretary's approval, under Section 5 of the Hydro Electric Development Act (Scotland) 1943. If the Secretary of State decides the objections are genuine, and not merely time wasting, he would call a conventional, limited, Public Inquiry

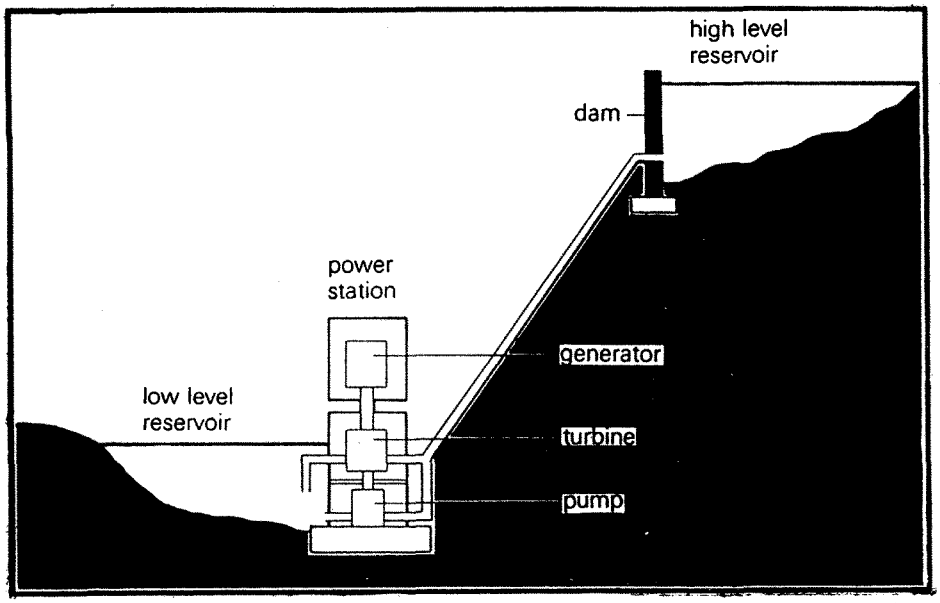
A Public Inquiry does not allow objectors to raise such things as the government policy which leads the Board down the path of increased generation to meet increased demand (as apposed to conservation). It certainly wouldn't tolerate altruistic considerations such as amenity vs commercial exploitation.

The Secretary of State does, however, have the power under the Town and Country Planning (Scotland) Act 1972 to call a Planning Inquiry Commission (PIC), the extended remit of which would allow a full context in which to place objections. Many letters from the various objecting organisations to the Secretary of State requesting a PIC received the same response. The Scottish Economic Development Department, replied on the Secretary's behalf: "Even if the proposals could be considered at a form of inquiry held under other powers, the Board are still bound to submit their proposals, and the Secretary of State is similarly bound to consider them, under the provisions of the 1943 Act." Convinced?

FRIENDS OF LOCH LOMOND

While the objecting organisations' secretaries were circumnavigating the muddy waters of governmental obfuscation, arguments against the proposal were being formulated and refined. The opposition needed to prepare their case well in advance of the publication of the Board's plan, because, under the 1943 Act, objections must be presented to the Secretary of State 40 days after publication of the proposal. A new organisation called Friends of Loch Lomond (FoLL) was formed to spearhead the campaign.

Central to the Hydro Board's justification for the scheme was their belief in very large peak demands arising around the mid 1980s. Their expectation was based on the 1978 forecast of a 4.5% annual electricity demand increase. However, with a then 79% excess of capacity over the highest demand of winter, and a



A pump storage system (Craigroyston's plant will be buried)

growth in demand of only 1% over the last 5 years, "the proposal is not, to put it mildly, convincing." It is interesting to note that in reply to a recent (1987) Parliamentary Question, Energy Minister Michael Spicer announced a forecast demand growth of 1.5% a year, for the next 9 years.

The Board have a conventional hydro-electric scheme on Loch Sloy which, the objectors argued, could be upgraded to a storage capacity of 1,600MW, equivalent to phase 1 of the Craigroyston proposal. The Board argued that this would cost £50 million more than Craigroyston phase 1, but when asked to produce a breakdown of their costings, they were found wanting. A spokesperson for the Board commented, "we feel we are being as frank as we can with the public, but we must remember that at this stage we are still only dealing with proposals which could be modified." The original estimated cost for Craigroyston of £220 million was later revised upwards to £330million.

INDUSTRIAL INVASION

Loch Lomond lies within the boundaries of the Queen Elizabeth National Forest Park. It has several honorary titles of which to boast. In 1974 the Secretary of State designated it a 'National Park Direction Area', giving it the status of a real National Park without the vital planning authority, which remains in the hands of the 4 local authorities. Scotland has no National Parks, even in this, the 150th anniversary year of John Muir's birth (the Scot who gave the concept of National Parks to the world). However, regardless of how official the title, National Park status holds no fear for the Generating Boards. The CEGB's Dinorwic (Europe's largest) and Ffestiniog pumped storage schemes, and Trawsfynydd nuclear power station, all lie within Snowdonia National Park.

The area is also a Site of Special Scientific Interest, as designated by the Nature Conservency Council. This means it is of "special interest by reason of its flora, fauna or geological or physiographical features." Its laurels are too numerous to list. As the FoLL are quick to point out, "We have only one Loch Lomond."

During the 7-10 years of the first phase of construction the peace and tranquillity of the area would be destroyed completely. The Ben and Loch attract countless tourists from all over the world, who provide an income of around £500million a year for the region.

The daily movement of the 1,000 strong work force, via the A811 and the B837 would cause a severe disturbance to the 2,000 people living between the villages of Drymen and Rowardennan. A large camp would be required for the 200 imported specialists who could not be found accommodation locally, and a large carpark for the daily invasion of workers.

After a period of consultation, the Board offered to upgrade the road between the two villages, and thereafter to the construction site. This would create a large scar on the Ben, even if the Board contracted the Forestry Commission to plant the odd conifer to hide the road.

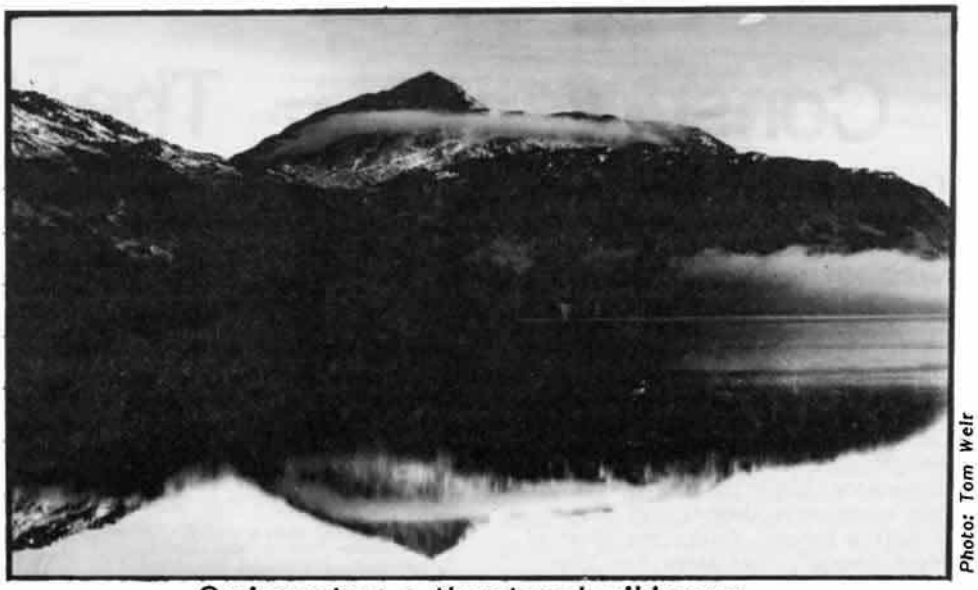


Photo: Tom Weir

Craigroyston: a threatened wilderness

The arguments presented opposing the scheme were numerous and convincing. However, the Board were not to be swayed by arguments of nature conservation, energy efficiency and low demand. After construction they "cannot see that it will interfere in any way with the enjoyment of the countryside and Loch Lomond."

The construction phase would have caused irreparable damage to the flora and fauna which gained the area its SSSI status. The 'local rock' dam would, contrary to Hydro Board mythology, be visible, and a metal contour line of 165ft high pylons and transmission lines girdling the north east slopes of the Ben would hardly blend into the area's natural beauty. Or would the Board make them from 'local steel'?

PLAN SHELVED

These were some of the more straight forward objections. But, what effect would the increased fluctuations in the Loch's water level have on its ecosystem? The Board argued that the fluctuations created by pumped storage would be no greater than natural fluctuations. Surely even their experts are familiar with constructive and destructive interference, ie if at a time of naturally low water level the Board then pumped water from the Loch up to the storage resevoir, it would be possible for the resultant fall in water level to be twice the maximum possible natural fall. This could devastate the Loch's ecosystem.

It must have come as a bit of a shock to the FoLL when the Board's threat sudenly lost its impetus, and became a rather vague proposal. Their 1979/80 Annual Report commented: "The timing of this scheme will depend on future demand and the results of the Joint Planning Commission." (The Joint Planning Commission involves the NSHEB and the SSEB - South of Scotland Electricity Board.)

The curtain came down on Craigroyston, Act 1, in June 1980. The Board announced that, "the formal promotion of this scheme has been postponed for at least 2 or 3 years in light of changes in demand for electricity throughout Scotland. The Board still consider the Craigroyston project to be the best pumped storage scheme in Scotland, but do not now foresee a requirement for any major pumped storage installation until the mid 1990s."

This was the last public reference to Craigroyston.

PRIVATE PLANS

When questioned by SCRAM this year they admitted that Scotland, true to convention, still has a massive overcapacity, which can only increase when Torness comes on stream: "we have no intention of resurrecting the proposal in the foreseeable future."

Perhaps now the FoLL can breath a sigh of relief? Or perhaps not? The threat to Craigroyston hangs over Loch Lomond like some latterday Sword of Damocles.

The question is: would Craigroyston be attractive to a private company? Because of Scotland's legendary overcapacity, there is plenty of 'cheap' electricity to be had, especially at night when the large inflexible base load nuclear stations are still generating, regardless of demand. But what would the company then do with this electricity?

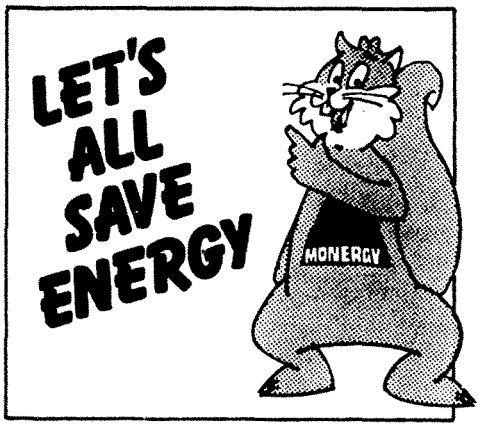
Perhaps they could sell it 'down the wire' to England at times of peak demand: it is rumoured that Cecil Parkinson would like extra transmission lines to be built from Scotland to enhance competition. He has also promoted the sale of the Scottish electricity boards with an enhanced ability to sell power to the south.

As we approach the electricity renaissance, Craigroyston may once more appear on the energy agenda. Even if there is sufficient demand to validate new supply, we must conclude that, regardless of economics, Loch Lomondside must be protected. The swift erosion of areas of outstanding beauty for the sake of unnecessary new supply must stop.

The campaign for an environmental protection agency, privatisation or not, with real power to oppose industrial vandalism, must start now!

Conservation - The Fifth Fuel

Over the years, government Ministers have been extolling the virtues of energy conservation. However, this never seems to advance very much further than publicity campaigns. ANDREW WARREN takes a quizzical look at government commitment.



It is now fifteen years since the Yom Kippur war first made the world aware that fuel supplies could be both expensive and finite - and the 'Save It' slogan was launched, to the delight of a thousand second rate comedians. Since that time, numerous less memorable slogans and campaigns - 'Lift a Finger', 'Make the Most of Your Energy', 'Get More For Your Monergy' - have been created, all intended to make us just that much more conscious of our continuing profligacy.

But despite all this Britain remains, on EEC figures and at our own admission, way down towards the foot of the energy efficiency league for Western nations. Even since 1983, when Peter Walker arrived as Energy Secretary, the Government propaganda machine has been pumping out the same objectives: reduce the national annual fuel bill of £35 billion by some 20%; use tried and tested energy saving devices to achieve this; save Britain from wasting £7 billion a year; make Britain the most energy efficient nation in Europe.

Even the Prime Minister has been heard enunciating precisely these figures, throwing in for good measure the way such 'good housekeeping' could create jobs. Certainly the present incumbents at the Department of Energy, Cecil Parkinson and his Minister of State Peter Morrison, can be heard chanting this incantation regularly.

MOBILE GOALPOSTS

Originally, the objective was to achieve these savings "within the lifetime of the Parliament," although as time moved on and the next election drew ever closer, the choice was open either to abandon the electoral process or to move the goalposts. Unsurprisingly, the latter course was preferred, and at the beginning of last year the Department of Energy's in house propaganda sheet led with the headline "Number One By 1990."

Are such claims a triumph of hope over expectation? Can they not be dismissed as mere politician's hyperbole, intended to point the noses of the troops in the right direction, whilst recognising that the Holy Grail would remain forever elusive?

INADEQUATE INCENTIVES

The temptation is ever there to respond thus. But it is a temptation to be resisted, largely because the declared objective should be all too easily achievable, with a little careful planning and with very few risks. It is now several years since the head of the Government's Energy Technology Support Unit, Dr Ken Currie, appeared before the Commons Energy Committee, and confirmed that sufficient cost-effective and reliable energy conserving artefacts existed to save not just the 20% objective, but rather 40% of current energy use. Furthermore this could be achieved, the Commons Committee concluded, using primarily indigenous materials and skills - as would be true of any mainly construction industry activity.

But if this is so, why do we still:

- Continue to live in some of the coldest, draughtiest homes?
- Have some of the lowest energy conservation standards for new buildings?
- Have many more households suffering from fuel poverty, and higher death rates per winter from hypothermia, than countries with harsher climates?
- Fail to seize the opportunities for creating jobs via the manufacture and installation of energy saving equipment, particularly in the rundown building stock of the inner cities?
- Permit the public sector, occupying half the building stock, to waste £800 million a year on fuel whilst doing so?
- Refuse to compare the cost of (for instance) the projected £40 billion new power station construction expenditure, with those for reducing the need for these via energy conservation?

I suspect that the answer is simple, and it is a legacy of the era when 'Save It' was first around. Energy conservation is still perceived as a negative concept, predominantly of interest only to those committed to 'alternate' life-styles. The concept of having to suffer to save still lingers on - and who wants to wear a hairshirt for ever?

A house may be built to last 70 (or more) years, but the average occupant will be there for just seven of these - thus reducing interest in the introduction of longer term conservation measures. An aspiring business executive would always prefer to be known as the instigator of the new production line, rather than the improver of the boiler room.

THE WAY FORWARD

The megaliths who supply our fuel, (whilst studiously paying lip service to energy efficiency) will always argue for more consumption of their own commodity - even when it might pay them to forego new power sources. And a politician is always going to be happier to be filmed opening a new oil or gas field than rolling out insulation in a cramped loft.

In practice, the Fifth Fuel, energy conservation, can be demonstrated to be positive. It can improve comfort, cut costs, reduce waste and pollution, create warmth. But achieving success for what can still be dubbed 'the cause' may require rather more intervention into the market place than some would prefer to consider. But if we still retain these laudable objectives to save £7 billion a year waste, we shall have to recognise that slogans alone are unlikely to achieve them this century.

Plant a Tree ... for Energy!

An 'energy forest' combines a new use of land with the urgent need to find alternative forms of energy. MARJORIE BROWN describes the research which has been carried out in Sweden, and suggests we should introduce the system in this country.

By the year 2000, according to the Countryside Commission's 'New Opportunities for the Countryside,' 23% of agricultural land may no longer be required for food production. It is proposed that farmers be given financial incentives to help them diversify into other activities, like planting and maintaining woodlands. If some of these woodlands were 'energy forests', the powerful farm lobby would be joining the battle to find alternative forms of energy.

Energy forests in other countries have supplied energy raw material equivalent to at least 6 million tons of oil, as well as supplying raw materials for chemical and pharmaceutical products. In this country, they may also help to alleviate the problem of rural unemployment.

The value of an energy forest can be usefully compared with growing a cereal crop like barley. A real surplus can be obtained from an energy forest, compared to a field of barley. Swedish scientists have calculated that, allowing for a pessimistic forecast of inflation at 6%, and an interest rate of 12%, cultivation of an energy forest can be profitable after 6 years.

The great advantage of this form of forestry is that the farmer does not need to wait until a mature tree grows. The trees used are quick growing willows; in fact the willow has been described as 'instant tree' because of the speed of its growth.

The land to be used for an energy forest needs to be moist and open to allow the roots of the growing trees to take up the nutrients they need. Agricultural land, even of poor quality can be used if it is at present being cultivated, but it must be moist and, also, slightly acid.

If the forest has grown well, it is claimed that between December and March, 3 to 5 years after it was first planted, between 36 and 60 tons of dry matter per hectare can be harvested. Fuel from energy forestry has a heat value of about 19.5 Megajoules per kilogram dry matter. Moisture of course lowers the heat value. A second rotation is begun after the first harvesting. For the next 20 years, 12 to 15 tons of this dry matter can be gathered per hectare each year.

An energy forest seems to supply the answer to some anxieties that have been expressed about the future of our countryside. A combination of farmers given money for forestry, and spare land to use it on, may raise the spectre of a landscape of conifers, of England's green and pleasant land becoming more and more like the Black Forest. Marion Shoard in her excellent book 'This Land is Our Land', rightly compares the 'coniferisation' of the countryside to the devastation caused by clearing land to make a motorway.

However, an energy forest is not a monoculture of conifers, but comprises deciduous trees. A commercial conifer plantation cannot support a diverse wildlife, whereas an energy forest will. Thus new habitats would be created, to replace those destroyed by uprooting hedges and cutting down existing trees, which has been done on a large scale.

Pioneering research has been done in Sweden on all aspects of energy forests, and much published work is available. Their trees did best on land south of latitude 60° north, where the growing season was from 170 to 250 days long. Precipitation in the chosen areas varied from 350mm to 700mm.

Any forest creates its own internal climate and slows down evaporation. Thus any water lasts longer. This is important in a willow forest, willows being associated with watery sites. In future, the use of alders and poplars is to be considered in establishing Swedish energy forests.

The species of willow used were *Salix viminalis* and *Salix dasyclados*. The shoots chosen were first tested in the laboratory to make sure that they would sprout and grow quickly after cutting, that they would be resistant to frost and fungi, and of course, that they would produce good fuel.

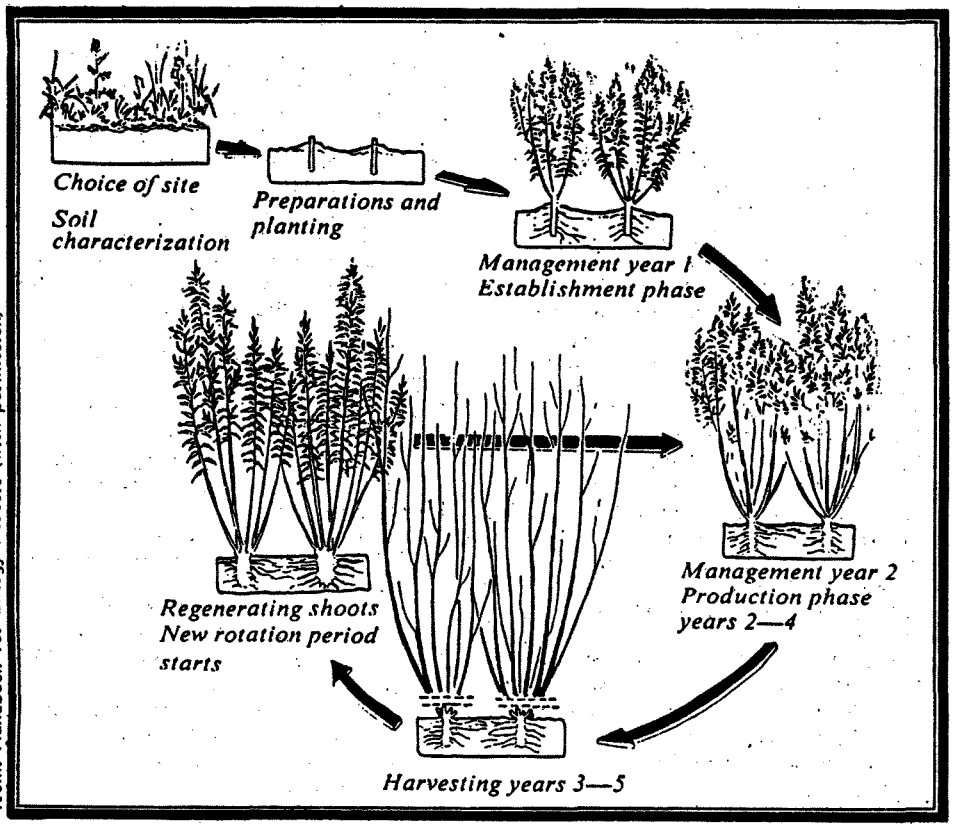
The diagram shows the stages in the development of an energy forest. Cuttings of 20 to 25 cm long, minimum diameter 8mm, are first put into cold storage at -4°C. They are taken from October to April.

Stages in prepping the soil involve taking 20 samples of top soil and 20 samples of subsoil. The planting is done by machine, 20,000 cuttings per hectare being put in.

In the management years, weeds must be controlled or they will stifle the young trees. An environmentally benign herbicide, glyphosate was used. This breaks down into carbon dioxide and water, and the dead weeds are removed. If the herbicide does not give good results, a rotovator is used between the rows. In good soils it may not be necessary to add fertilisers, but irrigation may be necessary if the soil becomes too dry.

Production during the planting year is low but thereafter subsequent rotations produce successively more fuel.

The Swedes benefit from having an energy policy, and it was their National Energy Administration which prepared a full evaluation of energy forestry, the results of which are summarised here.



from: Handbook for Energy Forests (with permission)

Stages in development of an energy forest

Further information about energy forestry may be obtained from: Swedish University of Agricultural Sciences, Department of Ecology and Environmental Research, Section for Energy Forestry, Box 7072.S 750.07 Uppsala, Sweden.

New Power Stations

The CEGB have applied to the Energy Secretary for permission to build two new coal-fired power stations, and appear to have once more stirred up the hornets nest of public opinion.

The proposed stations, at Fawley on the Solent and West Burton on the Trent, are the first major non-nuclear stations ordered in Britain since 1977. Each station would be fitted with the limestone/gypsum method of flue gas desulphurisation (fgd). This would produce 1 million tonnes of gypsum annually, which the board believe will be snapped up by the "buoyant British gypsum market."

The Local Authorities in Hampshire and the New Forest have issued a joint statement that they are still not convinced there is a need for a power station in this sensitive and environmentally important area. They have also expressed concern that some of the gypsum will have to be dumped. However they have yet to decided whether or not to request a planning inquiry. If they do, it should be an interesting, if short, event in light of last month's curtailing of planning inquiry rules, implemented by the Government to prevent a repeat of the Sizewell marathon.

Both sites have been chosen strategically to enable the Board to avoid using coal mined by the NUM. Fawley is in an ideal position to accept imported coal via Southampton Docks; and West Burton is in the heart of UDM country. It was at a UDM conference that Lord Marshal was "exceptionally delighted" to make the announcement.

The two stations represent the next stage in the Board's 'big is beautiful' campaign. Each will have two 900MW turbine-generators, the first of their kind in the UK.

The stations are expected to cost between £1.2bn and £1.5bn each (1987 prices). The CEGB believe this will represent a 'real' decrease in price for coal plant of between 20% and 30%, which will more than cover the cost of the fgd units which the Government say will be fitted to all new coal-fired power stations.

Conventional wisdom says that large plant offer economies of scale. However an article in the (Jan 88) Physics Bulletin, the Journal of the Institute of Physics, argues that "huge plant are each virtually one-offs and therefore expensive. Small units permit economies of bulk production instead... Following this logic we are now seeing the installation of gas-fired 'micro CHP' generators of 20-100kW in hotels and residential premises in this country, saving the owners substantial amounts of money."

Acid Rain

The CEGB have applied to the Energy Secretary for consent to build a £400 million flue gas desulphurisation plant (Fgd) at Drax coal-fired power station in North Yorkshire. (SCRAM 60)

The Board intends the Drax A plant to be operational by 1993, and the Drax B plant by the end of 1995.

CEGB board member Derek Jarvis said, "The development shows that the Board takes the need to care for the Environment very seriously indeed." Although the Drax Fgd should reduce the power stations sulphur emissions by over 90%, a mere 10% reduction in the Board's total sulphur emissions. Which is nowhere near the 80+% that environmentalists stress must be achieved if we are going to have any hope of reversing the ecological disaster threatened by acid rain.

Britain releases more sulphur dioxide into the atmosphere than any other western nation, in 1986 our emissions increased by over 200,000 tonnes, to 3.76 million tonnes.

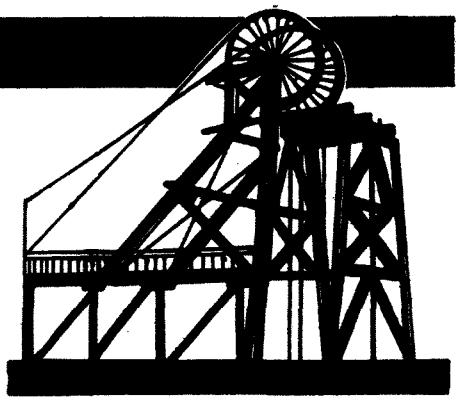
A Report, due to be published later this year by the Department of the Environment (DoE) will point the finger of blame at our own power stations for the environmental damage caused by acid rain. Over 80% of the acid fall-out in this country is British. The report also gives cause for increased concern for the nation's trees which "are only of moderate health." The Report, from the Acid Waters Review Group, overturns the previously held DoE belief, and admits that there is "strong evidence" that rivers and lakes have been turned to acid "in many geologically acid-sensitive areas of the UK."

This is a symptom of "increasing demand for energy," rather than a result of the UK's failure to install FGD plant, according to the junior environment minister Colin Moynihan.

Moynihan contends that UK sulphur emission trends "compare favourably" with other European countries. However, a recent report from the United Nation's Economic Commission for Europe tells a different story. They expect UK emissions to rise by 500,000 tonnes by 1990.

The UN Report outlines the dramatic emission control programmes in other western nations; 10 have already reduced their emissions by 30%, 11 expect to cut their emissions by 30% before 1995, and a further four nations should achieve reductions of 65% by 1995. The UK programme pales into insignificance by comparison.

Indeed, the UN report expects that by 1993 the UK will be emitting more sulphur dioxide than France, Sweden, West Germany, Denmark, Norway, Austria, Switzerland, Luxembourg and the Netherlands combined.



Coal

Scotland's remaining pits face virtual extinction, with the loss of almost 5,000 jobs, as a result of the SSEB's decision to put their coal requirements for the coming financial year out to tender on the world market.

The Board are threatening to import 3.8m tonnes of coal, and claim this will save them £50m, British Coal have gone to unprecedented lengths to keep their largest Scottish customer. They have offered a 10 year deal based on what their experts believe would be the sustainable world price in the 1990s - £1.51/GJ compared with their current price of £1.64/GJ. The SSEB have been pushing for a price closer to current world prices, despite the fact that world prices are particularly low at present, and most exporters are making a loss. Their intransigence is difficult to believe.

British Coal believe that the SSEB will only be able to import 1m tonnes, but they are worried that Inverkip will be taken out of mothballs to burn oil to supply the rest.

In 1980 the SSEB told the Select Committee on Energy that annual demand for coal would fall from about 8.3m tonnes when Torness was commissioned to 7m tonnes in 1989. In 1982, after the closure of the Invergordon Aluminium Smelter this was revised to 7.5m tonnes falling to below 5m when Torness is commissioned. British Coal are now fighting to retain sales of 4.7m tonnes in Scotland, from April, even before Torness has been fully commissioned. Deep mining jobs have fallen by 7,000 since March 1985.

Coming so soon after the closure of the Seafield mine in Fife, the SSEB's plans overshadowed the Scottish TUC's special conference on privatisation of the electricity industry in February. George Foulkes MP accused the SSEB of trying to boost profits in the run-up to privatisation by relying on child labour in Colombia and slave labour in South Africa.

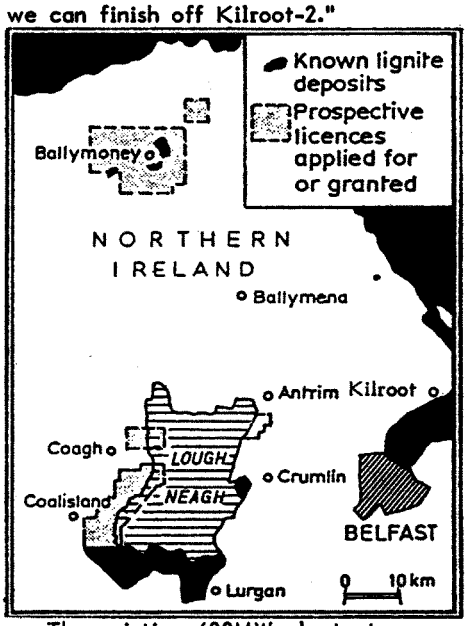
Campbell Christie, General Secretary of the STUC, said that "once the pits are shut and the SSEB is dependant on coal imports (they) will suddenly become more expensive." So we will be left with "a land under which lie some of the richest coalfields in the world, waterlogged and unrecoverable through short-sighted premature closure of our mining industry.

Lignite

The junior government minister for Northern Ireland Peter Viggers has accepted new bids for the construction of a controversial 450MW lignite-fired power station at Crumlin, near a lignite mine, after rejecting the original proposals in December. A department spokesman told SCRAM that a "decision is months away."

The two main contenders are Antrim Power, a private consortium headed by Bechtel and the Hanson Trust, and Northern Ireland Electricity (NIE), the Province's only electricity utility.

Although NIE are contending for the Crumlin contract, they would prefer to complete the 350MW second phase of Kilroot coal-fired power station, on which they have already spent about £150 million, and are currently spending £1.5 million a year on equipment storage. They argue that although, "we are not against the idea of lignite, we say that it is silly to go off and build a £500 million lignite station when for a third of the cost we can finish off Kilroot-2."



The existing 600MW plant at Kilroot is being converted from oil-firing to a dual coal/oil-firing, with the aid of a European Investment Bank loan of £63 million. It will be fuelled by open cast, low sulphur coal, from Ayrshire as would phase 2.

However, many observers believe NIE's participation in the competition is academic, and that the Minister will award the contract to Antrim Power, in line with the Governments intention to privatise the electricity industry.

Lignite is an intermediate stage between peat and coal, with a low calorific value (approx 1/3 that of coal). It has a tendency to combust when transported.

Antrim Coal who own the Crumlin lignite mine are wholly owned by BP Coal. According to BP the Crumlin lignite is unusually clean, and their potential to cause acid rain compares favourably with other fuels: BP claim that it would promote only 37% of the SO_2 that a similar conventional station burning steam coal would.

Private Power

The CEGB's 120MW disused coal-fired power station at Rogerstone in South Wales will be Britain's first privately owned and run electricty generating station.

The South of Wales Electricity Board (SWEB) have signed a deal with Independent Power and Energy's owner Angelo Casfikis (SCRAM 63) for the station's entire output for 10 years. The deal represents 10% of SWEB's power requirements, and it is for this reason that the Board have insisted on tough penalties if IPE fail to deliver.

Although refurbishment of the plant will cost around £40 million, Casfikis estimates that the contract with SWEB, worth £17 million a year, puts the project on a solid financial footing. But, there are concerns that the rates charged on the station could be up to 40 times those levied against its previous owners.

The Pollution Inspectorate have ruled that any station which has been closed for over 12 months cannot be restarted without the installation of desulpherisation equipment. This will add £10 to £12 million to the cost of Rogerstone's refurbishment. However, in a meeting last month with Cecil Parkinson, Casfikis was told the Government are examining ways to compensate private producers who produce 'clean' electricity.

For Sale
For possible private generation
Two dis-used Coal-Fired Generating Stations

Roosecote, Barrow-in-Furness, Cumbria
(4 x 30 MW Sets)
AND
Connah's Quay, Deeside, Clwyd
(6 x 30 MW Sets)
FOR PARTICULARS AND TO VIEW
Telephone 061-428 0711
Property Services Manager (North)
Central Electricity Generating Board
Europa House
Bird Hall Lane
Cheadle Heath
Stockport
Cheshire SK3 0XA

from: Independent Power News

IPE had hoped to buy two other disused stations from the CEGB but interest in them has been so great that the CEGB have decided to hold an auction instead.

There are over 100 disused power stations in Britain which could be sold to the private sector.

Wind Energy

CALIFORNIA

The world's largest wind energy project is now under way: over the next 3 years a Swiss company, Comapro Holdings, plan to install 900MW of European wind turbines, costing around $3bn, at four locations in California.

The 1,800 aerogenerators will almost double the Californian utilities installed wind capacity of 1,200MW. The utility are legally bound to purchase electricity offered to them from wind turbines.

Comapro intend to use medium sized aerogenerators - around 500kW - which cannot be provided by the American market, and are negotiating contracts with wind turbine manufacturers in Denmark, West Germany, and Austria.

It is from Austrian banks that the bulk of the finance for the project is being sought: Hans Aebi the company's vice chair believes Austrian Banks as particularly enthusiastic about the prospects of wind energy projects.

The wind farms will be built in conjuction with small pump storage schemes, allowing the electricity generated at off peak times to be stored, and then released through several 30MW hydro-electric turbines at times of premium prices.

Comapro believe the age of the wind farm has arrived and intend the Californian project to be the first of many.

KENT

The CEGB plan to start work on England's largest wind turbine in May, with a provisional commissioning date in February next year.

The 1MW turbine, to be erected at Richborough power station in Kent, is expected to produce around 2 million units of electricity annually - the average household requires approximately 4,000 units.

The turbine is being developed as part of a European wind power collaboration (SCRAM 61). Two similar machines are being built at Esbjerg in Denmark and Cabo Villano in Spain. Design information has already been shared and the results of extensive monitoring will also be exchanged.

The £3.3 million costs of the Richborough machine will be met jointly by the CEGB, Department of Energy, the European Commission (£1.05m) and the manufacturers - James Howdens of Glasgow.

The project is in line with international thinking that 'wind farms' based on large numbers of intermediate sized turbines are more reliable and economic than those composed of small numbers of large machines.

The saga of Britain's first wind farm continues: it is thought that this will be the final single generator project before the Government finally give the go-ahead for a home grown wind farm.

CHP

The Government have decided not to invest any more money in the Edinburgh 'lead city' combined heat and power project. (see SCRAM 61)

In answer to a parliamentary question from David Madel (C-Bedfordshire SW), energy minister Peter Morrison replied "My department has carefully considered the report prepared by the Edinburgh CHP consortium. I accept the consortium's judgement that the options are insufficiently attractive to proceed without further substantial support from public funds." He went on to claim, "It is the Government's long standing policy that combined heat and power/district heating should be taken forward."

Although it had never been agreed that the Government would continue to fund the project at this stage, Edinburgh Chp consortium convener Cllr Richard Kerely told SCRAM, "It has always been our long term view that such a project - in Britain anyway - is only sustainable and viable on a Public/Private package." He argues that a "project which requires a great deal of up-front investment and a good few years before any money comes through, represents a classic public spending commitment."

COCKENZIE IN DOUBT

Commenting that in this country no private investor would back such a project, and that although the consortium are not actively seeking foreign investment, "it is a possibility." But first they intend to seek a minsterial audience, "and see if we can impress them with the full strength of our case."

If the Government is dedicated to the idea of diversity of supply, perhaps they should set a 20% rule for CHP!

If the Edinburgh project does not go ahead the future of Cockenzie coal-fired power station - the heart of the proposal - is in considerable doubt. The SSEB told SCRAM that the "future of Cockenzie has never depended on the developments in CHP."

The Coal Board have an agreement with the SSEB to supply between 600,000 and 1.5 million tonnes of coal a year to Cockenzie up until 1992, and may be prepared to take court action if the SSEB renege on this agreement. The SSEB informed SCRAM that it is their policy not to answer questions on future contracts involving coal.

Belfast, one of the two other lead citys, is a very similar proposal to Edinburgh and should expect to receive no Governmental backing. Leicester however have set up their own company and are now an ongoing concern. Their system is based on a gas turbine generator (see SCRAM 59). Currently gas gives a higher rate of return.

Hybrid Generation

A hybrid generating system (diesel/wind/battery), has been installed on the Island of Cape Clear, off Eire's southern coast.

The Ir£0.5 million cost of the project is being met by: the German (50%) and Irish (10%) Governments; the EEC Energy Demonstration Programme (30%); and the balance from the West German Companies SMA Regelsysteme (the system managers), and Man Technology of who provided the wind turbines.

Formally the community of 150 relied on a traditional diesel gen-set: the system, which was inaugurated on the 23 October, is expected to cut their consumption of diesel by 60 tonnes a year. The two Aeroman 30kw wind turbines have accounted for 75% of generation since the inauguration.

One of the main reasons for choosing Clear for the project is the Island's Co-operative (Comharchumann Chleire Teo), who formed in 1970 to "arrest the downward trend in the Island's population." The Eire National Board for Science and Technology praise the islanders involvement: "Now that the system is operational the Co-op monitors it and does routine maintenance. The technical competence and hard work of the Co-op cannot be overstated. Everyone on the Island worked hard to make this project succeed."

It is interesting to note that until a couple of years ago the islanders paid around three times the mainland price for electricity. This was deemed unfair and the balance was redressed. Ironically, as the new system's electricity is cheaper they are now subsidising mainland electricity prices.

The inauguration of the system was attended by Charles Haughey, an Taoiseach, who is a known supporter of alternative energy. The German Minister for Research and development, Dr Heinz Riesenhuber also attended the ceremony.

Fuel Poverty

WACH, a consortium of voluntary organisations, are calling for action "on the continuing plight of millions of low income households who cannot keep warm at a price they can afford."

They are organising a new campaign, 'Winter of Action on Cold Homes'. The new campaign is being spearheaded by the publication of *Fuel Poverty: Briefing.**

Although between October '86 and March '87 only 578 deaths were officially recognised as hypothernmia caused, there is evidence to show that over 30,000 deaths a year can be "attributed to hardships caused by winter."

Since 1978 government funding for insulation projects has fallen by over 22% yet the people who suffer most from fuel poverty - the elderly, the unemployed, and single parent families - have all substantially increased in numbers.

* *Available from NEA, 2-4 Bigg Market, Newcastle upon Tyne, NE1 1UW. Price £2.50*

News in brief

Three oil-fired power stations in Kent have been granted a last minute reprieve by the CEGB. They are worried that environmental resistance might frustrate their campaign for a new coal station at Fawley and the Hinkly Point C PWR.

The Board are anxious that if they are not allowed to carry out their ambitious programme for 4,000MW of new capacity a gap in supply by the mid 1990s might occur.

Although their fears are shared by the Department of Energy, the Treasury are less convinced.

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The Government's energy conservation programmes are saving around £700m a year according to energy minister Peter Morrison. Also, his colleague Michael Spicer estimates that in ten years time coal will fuel 60% of electricity generation with 14% from nuclear 17% from oil, 3% from hydro and 5% from alternative sources.

Both statements were made in reply to parliamentary questions posed in January.

The Faroe Islands plan to generate 20% of their electricity requirements using a floating tide-water generating plant.

It is expected to provide 33GWh per year and was designed by the Danish company Birch & Kroyboe. It will exploit the very fast tidal regime in the deep narrow channels dividing the islands.

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Government controls on the use of oil and gas in small power stations were withdrawn at the end of January.

This means the operation of oil or gas stations rated under 10MW will no longer require the approval of the Department of Energy. The decision, which contradicts the very tight restrictions advised by the EEC, is good news for the country's expanding micro/mini CHP industry.

Energy Minister Peter Morrison who made the announcement added, "these requirements should not be a bar to major power station projects that are economically justified."

THE JOURNEY

A film for peace with international public support in Australia, Canada, Denmark, Finland, France, West Germany, Italy, Japan, Mexico, Moçambique, New Zealand, Norway, Scotland, Sweden, Tahiti, USSR and the USA.

Produced and directed by Peter Watkins (director of The War Game).

'A primary reason for making The Journey is to challenge these automatic assumptions-the assumptions that 'truth' and 'objectivity' are unassailable prerogatives of the mass media and centralised educational systems . . .'

It is my hope that the very experience of seeing the film will help to create space in peoples minds-a space from which to challenge those multiple structures in society today which are so depleting our energies and room for manoeuvre.'

The Journey is a truly revolutionary film—a film which challenges not only the nuclear arms race, economic exploitation, racism and the connections between these, but also the way conventional film technique manipulates us, the audience. It is not an ordinary narrative film with beginning, middle and end: if you miss the first parts you can still follow the film. It's also a very long film, but then can we sensibly discuss the multiple problems which affect our world in ninety minutes? The Journey is an attempt to tackle these problems—it is offered as an example of HOPE.

The Journey will be shown on Saturdays: March 5, 19, 26, 11.30am until 5pm, in the Edinburgh FILMHOUSE. There will be a 40 minute interval. £2.50/day or £6 for the full film (concessions: £1.50/£4): all seats are bookable.

For further information: Secretary of the Journey Film Trust, Billy Wolfe, 35 Royal Park Terrace, Edinburgh (031 661 3049).

'The Journey' is the result of four years of travelling the globe by Peter Watkins, the director of 'The War Game'. The money for this huge project was raised by support groups in 13 different countries, with no support coming from any established source of funding, except the National Film Board of Canada, which donated resources and expertise free of charge. The fund raising was co-ordinated by the Swedish Peace and Arbitration Society.

The audience the film is really intended to reach is not just the peace movement: Watkins wants to speak to ordinary people who feel there is something wrong, but don't believe anything they are capable of doing would make a difference. 'The Journey' is offered as one example of hope.

What is 'The Journey' about? The core of the film is made up of interviews with families in Australia, France, Germany, Japan, Mexico, Mozambique, New Zealand, Norway, Scotland, Tahiti, the USA, and the USSR. They are allowed to express their feelings about nuclear war, the arms race, poverty, racism, economic exploitation, their daily hardships, and the connections between all these things. Their comments range from the seemingly banal to the positively mindblowing.

The film is not to be consumed, but to be lived with - as a work of art should be. The pattern of the subject matter, chosen seemingly at random, does not change throughout the film: what changed for me was my got to know them better. In fact, I think the full emotional impact of the film for me did not take effect until after it was over.

'The Journey' is about breaking the silence which the nuclear weapons state imposes on us. As Peter Watkins says, it is intended to "create a space in people's minds - a space from which to feel more secure to challenge the multiple structures in society today which are depleting our energies." It certainly did that for me.

DAVID KING

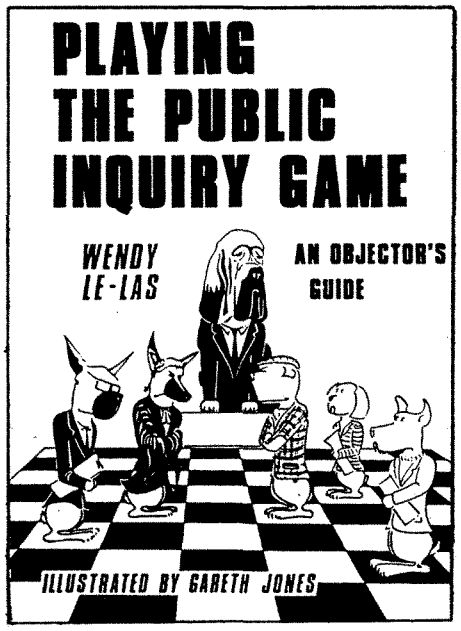
Playing the Public Inquiry Game by Wendy Le-Las. Osmosis, 1987. 98pp, £5.50.

Aleister Crowley once said, "The trouble with magic is that it doesn't work." The same could be said about public inquiries.

However, the public inquiry is the only procedure through which the lay person may attempt to prevent the building of a power station, the destruction of a listed building, a motorway through an environmentally important area, etc, etc ...

Wendy Le-Las' book will help the objector make it work a little better.

Are members of the public really expected to be able to step into a semi-judicial inquiry and present their case with the fluidity and practice of the CEGB's legal mercenaries?



When the stakes are high, and you are up against a major company the inquiry becomes a question of finance - with the spoils going to the highest bidder. How many protest groups can afford to pay for a lawyer at a minimum of £70 per day? And if the appellants really mean business they could hire a full blown QC, at around £1000 a day - pricing protest out of the market.

Contained within the pages of this volume are many fascinating descriptions of inquiry procedure, including a section which strives to give the topic a historical perspective, going some of the way to explain how the system has evolved to its present status.

I recommend it to anyone interested, or likely to participate, in an inquiry; just so you understand the procedures by which you are being conned. The only addition that I would suggest is an index, which is notably lacking.

MIKE TOWNSLEY

Radioactivity & Nuclear Waste Disposal by Foo-Sun Lau. RSP (Distributed by Wiley), 614pp, £69.75.

A scientific textbook to provide (wealthy) engineers with a background to nuclear waste disposal - perhaps to assist recruitment to the repository programme.

The book's premise is that nuclear waste "should not constitute a burden on succeeding generations." In other words there is a presumption in favour of geological disposal. It gives a comprehensive overview of the state of the nuclear waste disposal in 19 countries.

There is a substantial introduction on the nature of radioactivity and acceptable levels of exposure, which it would have been better to miss out to make the book cheaper. It has a quite incredible list of 700 references and some useful looking Appendices on things like the half-lives and the particle and transition energies of radionuclides.

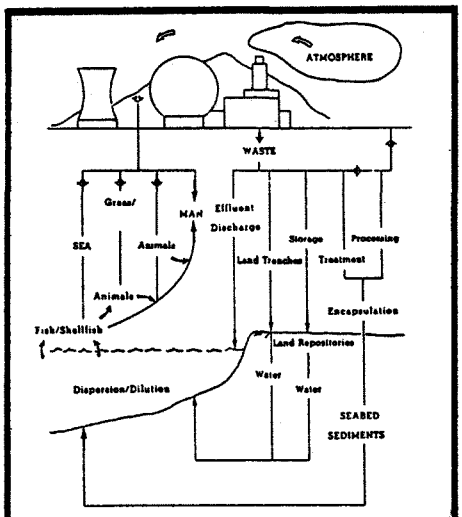


Fig. 42: Pathway of radionuclides through the environment from natural sources and from nuclear waste management.

The book is obviously a valuable resource - you don't have to agree with its conclusions to find it useful.

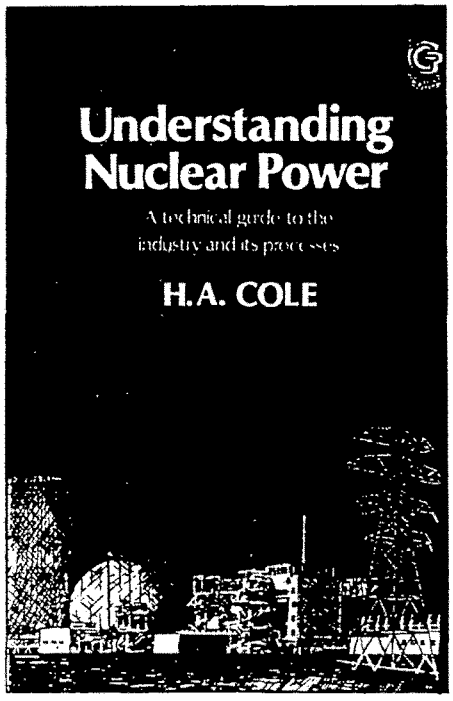
PETE ROCHE

Understanding Nuclear Power by H A Cole. Gower Technical Press, 1988. 410pp, £30.

It is possible to write about nuclear power in an "honest and unemotional" manner, as the introductory blurb to this text indicates. However, this emotionally volatile and blatantly doctrinal approach tendered by H A Cole is not one of those texts.

Cole has spent the last ten years working in the UKAEA's public relations department. Apart from endowing him with a writing style slightly more stolid than yesterday's porridge, it has given him a singularly insensitive and patronising attitude towards those opposed to nuclear power. This is only matched by his fanatical approach to all things nuclear.

All that Cole really seems to excel in is putting exclamation marks at the end of sentences deriding non-nuclear



energy sources. This is a pity, for he is clearly an intelligent person, as the chapter on the chemistry of radiation shows.

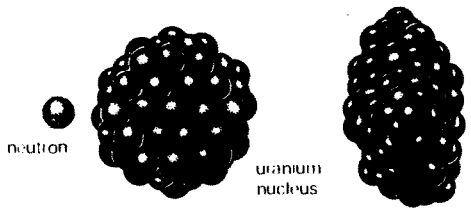
A clear and comprehensive guide to the workings of nuclear power should be an essential element of every school library. Fortunately several such books already exist, notably Walt Patterson's *Nuclear Power* available in Penguin. Cole's book is not one of these. However, any student of propaganda will find it useful.

THOM DIBDIN

Reviews

How it is Made: Electricity by C L Boltz; Faber and Faber. 32pp, £5.95 (HB)

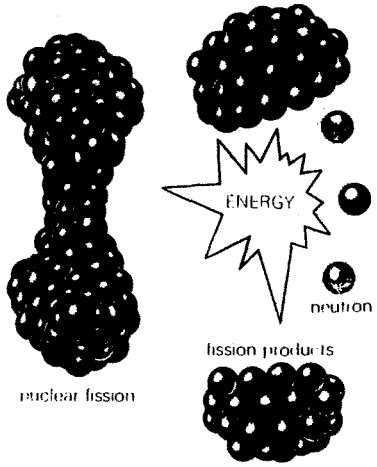
Electricity is of course taken for granted by almost everyone who uses it. How many actually understand the basic principles involved in its cycle? This slim volume provides an insight into the complex mechanisms involved in its production, transmission, and end-use.



This is essentially a school book, and as such gives me cause for concern, it provides no information on the very real social and environmental factors arising from the electricity cycle.

"A nuclear power station although cleaner than a coal-fired station does not give the same feeling of massive power." If you can't see it, it doesn't exist! It is fatuous statements like this that mar the volume, which is a shame because, when it comes to uncontroversial topics, Boltz' descriptions are very clear and informative.

A book to be lost on the shelf beside the SSEB's monument to bias, *Here be no Dragons*, or alternatively, and far more useful, it could be turned



into an excellent set of information sheets by some enterprising teacher.

MIKE TOWNSLEY

Consequences of a Nuclear Accident: study prepared by Dr Don Arnott for the District of Wrekin Council, 1987. 24pp.

Wrekin Council commissioned this study into a nuclear accident occuring in this country, and the probable effects on their district, from Don Arnott early in 1987. It was published in December.

The report contains useful chapters introducing the reader to the basics of how nuclear fission works and about radioactivity and its effects. These sections have the feel of a secondary school textbook on the subject and, as such, deserve a wider circulation. But, I felt the nuclear fission chapter was a bit long and may have been better treated as a glossary of terms.

The first chapter puts nuclear power accidents in context with other industrial accidents and discusses the thorny issue of human error, whether it be at the design stage, during maintenance or inspection, judgement during operation. Each type of error is illustrated with examples.

Other sections cover what patterns of reactor accident are possible, and what can be done in the event of one occurring: options include advance warning, potassium iodate pills, radiation monitoring, and evacuation.

Don reckons that iodate pills should be pre-distributed to doctors, health centres and schools (compared with the current practice of storage at police stations); local authorities should undertake monitoring, individually or in concert with other councils; he is, however, critical of evacuation - "in the case of a small and overcrowded island the awkward question arises ... Where are these people to be evacuated to?" He concludes that, although "second-best", Government advice to stay indoors should not simply be written off. He accepts that more intensive and objective study should be carried out on evacuation.

The report finishes with suggestions for Wrekin Council to adopt: begin a monitoring system compatible with those operated elsewhere, involve the local community as much as possible, and pre-distribute iodate pills.

For me the most interesting section is the one titled "The Truth about Chernobyl." It led me to research the subject and produce, with Don's help, the article in the centre pages of this issue of SCRAM. If Chernobyl underwent a prompt critical nuclear explosion, can it happen in other reactor designs?

I have some reservations of the report, not about its content but about its design and production. There are a few irritating typos in the text which should have been easily spotted during proof-reading, and the style is type-script rather than typeset which gives it an amateurish feel when it could have looked so much better if more time and money had been spent on it.

I understand copies of the report can be obtained by sending 50p to Wrekin Council, PO Box 215, Malinslee House, Telford, Shropshire TF3 4LF.

STEVE MARTIN

Nuclear or non-nuclear futures? Collected papers from the symposium held at the South Bank Polytechnic, April 1987. South Bank Polytechnic, Borough Rd, London. 232pp, £7.

Almost a year ago, and one year after Chernobyl, experts from all facets of the nuclear energy debate met at the South Bank Polytechnic to state their positions.

For those lucky enough to be present, it was a fascinating, if tiring, three days. For those who were not, the Poly have now published the 32 papers presented to the conference in a single volume.

The real strength of this book lies in the diversity of opinions presented and the range of subjects covered. Dr Alice Stewart examining the health effects of low level radiation, Clive Ponting outlining democratic control, Andrew Holmes reviewing European nuclear power after Chernobyl and Dr Michael Clark MP presenting the Government's private perceptions and public arithmetic on nuclear power, all provide succinct analyses of the current state of affairs, as they see it.

A large proportion of the papers examine future energy supply. Sadly, renewable energy sources are not emphasised, although coal, conservation and CHP are all well represented. For me, the two most exciting papers were from Sweden, where nuclear power is to be abandoned by 2010. A non nuclear future really does seem feasible.

All in all, these papers provide an excellent summary of, and introduction to, the issue of future energy demand, with or without nuclear. This is a book which will be invaluable for the many students who approach SCRAM for information on the nuclear debate.

THOM DIBDIN

Little Black Rabbit

Little Black Rabbit's log.
Star date: 1 January 1988.
Status: Hung over.

Our 5 hour mission: to boldly go where only keen journalists have gone before; to explore the public records office; to seek out information on nuclear power which has been released under the 30 year rule.

But seriously, much has appeared in the press about the Windscale fire since the turn of the year. But there were other items of interest.

In 1957 MacMillan's government abandoned plans to build a nuclear powered super tanker, despite protests from the nuclear and ship building industries, because of "problems with development of the new gas-cooled reactor." Just as well, eh; imagine it Torrey Canyon, Amoco Cadiz - nuclear waste as well as oil on the beaches! (The beaches are covered with nuclear waste now anyway!)

What about this one? A minute of the Dounreay catering sub-committee, however, was not available for perusal; it has been withheld beyond the 30 years after its initiation date. Whatever for - was Chicken Kiev on the menu?

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This month's Labour Party Scottish Council Annual Conference will debate 4 motions on nuclear waste disposal. They range from a detailed and closely argued motion from Ross, Cromarty & Skye Constituency Labour Party, to a short and straightforward one from Central Fife CLP: "Conference opposes all proposals, whether emanating from the Government or the nuclear industry, to use any sites in Scotland for the dumping of nuclear waste."

Caithness & Sutherland CLP have also submitted a motion calling on the Scottish Executive to oppose nuclear waste dumps in Scotland "until responsible and acceptable solutions to the problems of storage and disposal of such wastes are found." LBR wonders whether Caithness & Sutherland CLP regard the low level dump, or the high level stores, at Dounreay (which is within their boundaries) as "responsible and acceptable solutions."

The CLP also urges the Scottish Executive "to liaise with any government or group interested in finding an international solution." They should maybe begin with Tam Dalyell who's views on nuclear dumping leave something to be desired.

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Dounreay seems to be very popular with tourists: a total of 9099 Dounreay disciples visited the site in 1987, more than any other UKAEA establishment, and 5418 availed themselves of the guided tours around the plant.

Dounreay is not, however, very popular with some of their sub-contractors. Press Construction Ltd will be leaving the site in March after 19 years. Their remaining 15 fitters and welders could all be paid off. Two other companies Hall & Tawse and James Scott Ltd have recently laid off workers, and many contractors are also doing so. The Trades Council Chairman blames the Government's decision to put the UKAEA on a trading fund basis: "The squeeze has been put on," and "it is outside contractors who tend to suffer first."

This is indeed ironic, for a special unit for Dounreay was announced in January. Its purpose is to promote Dounreay's 'technical supermarket' in the commercial world and follows the UKAEA chairman's call for the site to increase its proportion of commercially funded work. This work will include non-nuclear business as well as their more usual expertise.

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On his first visit to a nuclear plant since his elevation to Energy Secretary after his enforced rest in the political wilderness, Cecil Parkinson dropped a hint re Dounreay and EDRP: "This facility was not built in the hope that there would be an EDRP. It exists in its own right ... It is wrong to focus all of one's thinking around EDRP."

But he spoilt it when, in a reply to a question on EDRP, he said that it was a Scottish Office matter not his: "My visit is about Dounreay as it is. The public inquiry is about Dounreay applying for *and hopefully getting* the permission for EDRP." Let's hope that Malcolm Rifkind wasn't listening to this 'order' from the top.

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Many years of campaigning has taught LBR not to believe everything which appears in the newspapers. Too bad the editor of *Atom* hasn't learned the same lesson.

An article in the 'In Parliament' pages of their December '87 issue was entitled "Export of weapons grade plutonium" and contained the alarming revelation that "The Government has given British Nuclear Fuels permission to sell the equipment and knowledge to make weapons grade plutonium to states without nuclear arms..."

LBR was shocked by this apparent breach of the Non-Proliferation Treaty, and contacted the editor to check up the source of the story. "We got it from the *Guardian*," was the reply. Sure enough, a story headed "Britain to export weapons-grade plutonium" appeared in the 2 October edition of the 'quality' newspaper.

To be fair, the article itself doesn't actually state that fissile material will be exported; the blame for the error must rest with the sub-editor. However, the *Atom* team used the same headline; they should have known better.

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Little Black Rabbit would like to thank, on behalf of SCRAM, all those people who made donations to their Appeal. So far, just over £1000 has come in - short of the £10,000 target!

Particular thanks go to those who have filled out the standing order form - SCRAM now has an extra £50 a month coming in regularly to the wages fund.

If you were thinking of making a donation, or taking out a standing order, please do so now - SCRAM needs your support.

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I would like to subscribe to SCRAM. I enclose cheque/postal order, payable to SCRAM for:

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Address . . . . . .
. . . . . .
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Please pay on . . . . (1st payment) the sum of . . . from my account number . . . . . to the Royal Bank of Scotland, 142/144 Princes Street, Edinburgh (83-51-00) for the credit of SCRAM number 2 account 258597 and make similar payments monthly/yearly.

Signed . . . . . Date . . .

Please return this form to:
SCRAM, 11 Forth Street, Edinburgh
EH1 3LE. Tel: 031 557 4283/4.