

The Anti-Nuclear & Safe Energy Journal

SCRAM



62

60p



W. PLUM!

Juggling the Figures

Fuel Store Controversy

p 3

Magnox - Are They Safe?

p 9

Coal Emissions - No Easy Solution

p 16

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

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COMMENT

A year ago Babcock, the West of Scotland boiler manufacturers, made 620 workers redundant due to a lack of orders. They have now announced a further 475 job losses, despite securing contracts for steam generators and pipework for Sizewell B. This makes 5000 redundancies in 5 years. The STUC believe the Government should have brought forward orders for coal-fired stations instead of freezing orders during the Sizewell Inquiry. However, it's difficult to imagine, such a pro-nuclear government announcing coal stations in the middle of a nuclear inquiry and so soon after the miners' strike.

The future of the UK Power Engineering Industry now looks pretty bleak. Lord Marshall has already made it plain to the TUC Energy Committee that he does not want two British suppliers of power station equipment. In other words, after privatisation, NEI-Parsons would be superfluous. GEC-Babcock, Marshall's preferred choice, would probably be forced to compete with overseas suppliers like Mitsubishi of Japan.

The NUM in Sheffield reckon that 100,000 jobs are at risk because of privatisation, and another 70,000 jobs could be lost by the knock-on effects.

There is no doubt that we urgently need changes in the way our electricity industry is organised. We need to make sure that energy conservation can compete fairly with new supply; we need to ensure small generators - preferably dominated by local authority-run CHP stations and small-scale renewable projects - can receive a reasonable price for electricity which they produce; we need to introduce more democracy into what has become a bureaucratic monster.

However, we are not convinced, as some people seem to be, that privatisation is the best hope for closing down nuclear power on the grounds of economics. Cecil Parkinson has made it quite clear that he is determined to maintain a substantial nuclear programme. After all there are plenty of ways of hiding subsidies to the nuclear industry - top secret defence payments for plutonium, for example. They had better think again before they find themselves supporting something which threatens 170,000 jobs.

SCRAM JOURNAL INDEX

There is now available a comprehensive subject, author and review Index for the Journal. The Index covers issues Nos. 1 to 60 and costs £5.00.

Back issues are also available and cost 30p each.

The cross referenced Index is ideal for research purposes and for general reference, it can be obtained from our office.

Fuel Store Controversy

Rumours of a dry storage facility to be built at Chapelcross, have intensified the anti-nuclear waste struggle in South West Scotland yet again. STEVE MARTIN analyses recent developments and the nuclear industry's motives.

The nuclear industry are trying to maintain a low profile over plans for a £200 million spent fuel dry storage facility, despite an announcement made in April last year that they were interested in building such a plant.

The announcement was made jointly by the Central Electricity Generating Board (CEGB) and the South of Scotland Electricity Board (SSEB) when they signed contracts with British Nuclear Fuels (BNFL) for reprocessing irradiated fuel from their Advanced Gas-cooled Reactors (AGRs). Two possible locations have been suggested - the CEGB's Heysham nuclear power station near Lancaster, and BNFL's Chapelcross works near Annan in south-west Scotland.

Observers see the emergence of the two possible sites as the public manifestation of a bitter feud within the nuclear industry. The CEGB would like to see the plant built at Heysham, but BNFL have proposed Chapelcross. In either case the plant is to be built by the electricity boards.

The proposed dry store, which will cover an area of 20 hectares, is meant as an interim 'buffer' store for spent fuel from the UK's 14 AGRs awaiting treatment at Sellafield. The Thermal Oxide Reprocessing Plant (THORP) is currently under construction, and will not be fully operational until 1992.

OPPOSITION GROWING

The CEGB say they need the buffer store because the stainless steel cladding of AGR fuel slowly corrodes if kept under water, the current storage system, for over 10 years. The store will also be capable of taking spent fuel from Pressurised Water Reactors (PWRs) and even vitrified high level nuclear waste.

Concern has already been expressed in both areas. At a meeting of

Lancaster City Council's Policy Committee in April, Labour Group Leader Abbot Bryning said, "I have sometimes thought in the past that we are a bit of a soft option when it comes to the construction of nuclear power sites."

In south-west Scotland political opinion is divided - Nithsdale District Council and Dumfries and Galloway Regional Council have both passed motions opposing the development; Stewartry District are marginally in favour; and Annandale and Eskdale District, in whose area the plant lies, "do not oppose" it.

At a public meeting in Dumfries on 17 September nearly 100 people voted overwhelmingly to oppose the plans, and a 'watchdog' committee has been set up to monitor developments and focus opposition.

JOBS BLACKMAIL

The proponents of each site have advanced employment arguments to support their choice. At Lancaster construction work is nearing completion on Heysham 2, the second AGR power station there, with the consequent effect on unemployment levels. Chapelcross is the second oldest nuclear complex in the country, the first of its four 60MW(e) plutonium production magnox reactors was commissioned in February 1959, and according to BNFL, "We have to look to the long-term future of Chapelcross. The power station is not going to run forever." Sir Hector Munro, Tory MP for Dumfries, is backing the plans because it could create 100 full-time jobs and 1700 construction jobs - the complex currently employs 650 people.

However, employment is an issue which the nuclear industry is fond of using in these days of increasing opposition to their activities. They fail to draw attention to the loss of jobs in the coal mining industry as a result of nuclear power policies, or the potential loss of jobs if the electricity industry is privatised. The employment problem in such areas as Sellafield and Dounreay is because of the nuclear industry and the planning blight which it creates, not despite it.

INSURANCE POLICY

The real reason behind the competing locations for the dry store is internal nuclear politics. In 1984 a CEGB memorandum recorded a decision to postpone "as far as possible" the reprocessing of spent fuel from the Sizewell B PWR, and opted instead for its long-term storage along with AGR fuel. It is widely believed that this was a ploy to put pressure on BNFL to reduce domestic reprocessing costs

below those of foreign contracts. At the signing of the £1.6 billion contract for the first ten years' worth of AGR fuel in April 1986, the electricity board chairmen announced that they were getting a better deal than overseas customers.

The current dry store proposal is seen as an insurance policy against increased costs, or THORP being out of commission for long periods due to accident or maintenance - it will be capable of storage for up to 100 years. Because the plant is a CEGB/SSEB initiative, BNFL would like to have it on their land so they can have an input into management and operational decisions. The CEGB are reported to be in favour of their site so they can dictate terms and use it as a bargaining counter when the time comes to negotiate the terms of the next ten year contract.

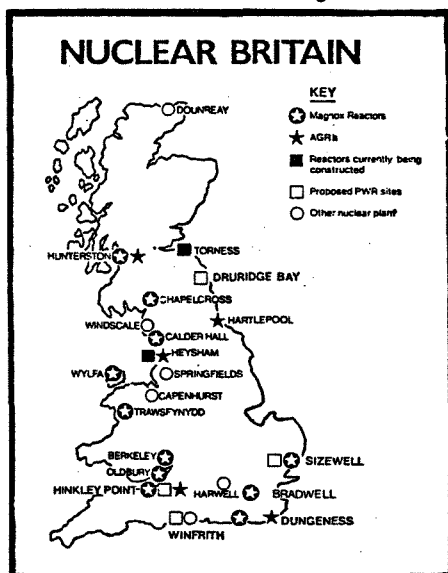
TRANSPORT CONGESTION

Whereas dry storage of spent fuel is preferable to reprocessing because it does not disperse radioactivity throughout the environment, one single centralised facility is not the answer. It will mean spent fuel from all the UK's AGR and PWR stations (and high level waste from Sellafield) converging on the chosen site; overseas spent fuel should also not be discounted.

The store has been designed by the National Nuclear Corporation and could handle ten spent fuel flasks a day, requiring 3 to 5 trainloads arriving each day. Chapelcross does not presently have a direct rail link and spent fuel from the site, and its nearest railway station at Annan has now been downgraded to an unstaffed halt; without a rail link the south-west corner of Scotland faces the prospect of ten slow-moving low-loader nuclear transports a day moving through a particularly congested section of motorway.

It appears that the communities of Lancaster and Annan are being used as pawns in a dispute within the nuclear industry: they are being bribed with the prospect of a few permanent jobs and slightly more construction jobs which, on past experience, will go to outside sub-contractors.

NIREX is about to begin a "public consultation" on nuclear waste disposal routes - the go-ahead for a dry store at either site, with a capability of storing spent fuel and nuclear waste for up to 100 years, would pre-empt this consultation. Opponents believe that allowing this development would give the nuclear industry a back door solution to nuclear waste. It is not likely a decision on siting will be made in the near future because, as Mr McDougal, the Chapelcross Superintendent, admits, the electricity industry "have a lot on their plate at the moment" with plans for privatisation. Strong opposition should be mounted now, before a planning application is lodged.



Leukaemia

Conclusions from three new cancer studies add weight to the argument that childhood leukaemias cluster around nuclear installations.

Two of the studies, reported in the *British Medical Journal*,* are a result of recommendations made in the 1984 Black report into the increase of cancer in West Cumbria. They examine mortality in children who attended school in Seascale, but were born elsewhere (the school cohort), and children born to mothers resident in Seascale (the birth cohort). Seascale is the closest parish to Sellafield.

The third study, reported in *Nature*,** examines the incidence of cancer mortalities near nuclear installations in England and Wales, irrespective of place of birth. Using information from the Office of Population Censuses and Surveys (OPCS), it concludes that there has been "no general increase" in such mortalities. However, "leukaemia in young people may be an exception, though the reason remains unclear".

The BMJ studies show that while there is no leukaemia increase in the schools cohort, leukaemias in the birth cohort were ten times those expected. According to the reports, this raises the question of whether any locality specific factors before birth or in early life caused the excess. Although the authors say that the studies cannot answer this, they hope that another, control, study in West Cumbria will "provide relevant information".

Previously, the Oxford Survey of Childhood Cancers, has shown strong evidence that all juvenile cancers have foetal origins. Dr. Alice Stewart, who lead the Oxford Survey, told SCRAM that "once again it is coming down that the really dangerous time is during foetal exposure".

A problem with the *Nature* survey is the crudeness of the OPCS statistics. It seems that the leukaemia cluster debate will continue until surveys, similar to those reported in the BMJ, are carried out around all UK nuclear installations.

**British Medical Journal*, 3/10/87
Volume 295, pages 819 to 827

***Nature*, 8/10/87, Volume 329,
pages 499 to 505

Demo

A demonstration will take place at Capenhurst fuel fabrication plant on 14 November.

Joint organisers, the Anti-Nuclear Network and Merseyside CND say that they have chosen Capenhurst for its involvement in both the civil and military nuclear cycles.

Assembly: Unemployed Centre, King Street, Ellesmere Port, Wirral, at 12.30 to march to the plant for Rally
CONTACT: Merseyside CND, 24 Hardman Street, Liverpool.
Tel: 051-708 7764

Fast Breeders

The European fast reactor programme received a setback when it was revealed that no new fast reactors will be built for at least five years.

The announcement, made in September by the five countries involved: France, Belgium, West Germany, Italy and Britain, means that plans to build three large fast reactors, to individual countries' designs, have been withdrawn. The countries now intend to seek a common breeder design by 1992.

The agreement could also scupper plans for the European Demonstration Reprocessing Plant (EDRP) at Dounreay. The French now claim that spent fast reactor fuel could be "coprocessed" alongside conventional fuel. This would get round the need for EDRP. The UKAEA, however, are reported to remain sceptical that coprocessing would be cost effective for commercial scale use.

The decision on where the next reactor would be sited has also been put off. Siting of the first of the original three reactors has always been an obstacle to progress, with France and West Germany both vying for the dubious privilege.

The European breeder programme has been hampered for some time, with the licensing problems at Kalkar (SCRAM 61) and the sodium leak at Superphenix in France.

Another implication of the decision could be that Italy may have to withdraw from the collaboration. One of the issues in the Referendum on 8 November, concerns the participation of the State electricity authority, Enel, in the construction and operation of nuclear stations outside Italy.

● Although the Sodium leak at Superphenix was found on 5 September, financial and safety repercussions from the leak will

continue to reverberate for some time. Research into whether the reactor can run without the flask is not due to start before next year. Until this happens, it will not receive a commercial licence.

According to Mycle Schneider of WISE Paris, this could have severe implications for safety, as many of the contractors at the plant will not get paid until the licence is granted. This will make the incentive to get the reactor back on stream, come what may, very high.

Local authorities are also losing out, as they were promised financial incentives for hosting the reactor. Although they will not receive any cash until the licence is granted, many of them have already started to spend it.

Dounreay

The "findings of fact" from the Dounreay inquiry have been reworded by the Mr Bell, the Inquiry Reporter, on the question of leukaemia clusters.

The draft has been changed to read: "the statistical evidence supports the claim that the West Thurso leukaemia cluster is unlikely to be due to chance, but the evidence is inconclusive", and that "there is a cause for concern requiring further investigations."

Following further representations from the Shetland Area Medical Committee, the need for an investigation was accepted as being "urgent". The final report is expected to be presented to the Secretary of State for Scotland before Christmas.

The Shetland Times have hailed the changes as a "famous victory" for the objectors, won by their "persistence and scrupulous adherence to purely factual evidence".

Sellafield Waste

BNFL are proposing to dump Intermediate Level Waste (ILW) in a repository under the seabed near Sellafield.

The project is said to be only one of several options being studied by BNFL, who have been told by Copeland District Council that they have to solve the ILW problem before the Enhanced Actinide Enrichment Plant can become operational.

The waste position at Sellafield is becoming increasingly precarious, as discharges to the sea are reduced and the Low Level Site at nearby Drigg becomes full. According to the latest report from the Government's Radioactive Waste Management Advisory Committee, estimates for the total volume of waste expected at Drigg have been revised upwards by 30%.

The repository will be about 800 metres below the seabed and half a

kilometre from the coast. Access would be via tunnels sunk within the Sellafield site. This would "minimise provocation and possible disturbance by anti-nuclear activists", according to documents obtained by Cumbrians Opposed to a Radioactive Environment (CORE).

The CORE documents also indicate that the waste would be neither retrievable nor monitorable. It will be placed in galleries perpendicular to the access tunnel. Once the galleries are full, they will be back filled with concrete.

The plans are independent from the NIREX proposals, although BNFL claim to have informed members of the NIREX committee. However, BNFL have not ruled out the possibility of an international facility at Sellafield. They have said that they would see this as extension of their existing business.

Accidents Will Happen...

TRANSPORT

● A contaminated railway wagon travelled from Sellafield to Heysham where it stood for four months before radioactive rust fell onto the tracks and was detected during a "routine check" in August.

A confidential CEBG report, revealed in the *Guardian* (27 August), says that 10% of all flasks and flatrols used to carry them are contaminated. This is reported to be a "considerable improvement".

BERKLEY

● Two workers received contamination to their skin during maintenance work on the secondary shielding at the number 1 reactor at Berkley in August. According to the station's staff newsletter, the contamination was safely removed.

DOUNREAY

● The Prototype Fast Reactor at Dounreay had to reduce power in early October, because seaweed had entered the cooling water pump house. It had passed through a special £2 million seaweed barrier, built only last year.

SELLAFIELD

● Workers at Sellafield took 80 minutes to find a leak of radioactive CO₂ at the plant on 4 September. The incident led to contamination of an area near the Calder Hall reactor.

● Two workers were contaminated by radiation from a vacuum cleaner, in late August. The workers were withdrawn from normal duties.

HUNTERSTON

● About two tonnes of "mildly radioactive" CO₂ leaked from the gas treatment plant of the number 2 AGR at Hunterston on 15 August.

The SSEB told SCRAM that the leak occurred in the joint of a flange of a pipe inside the plant. They did not say what caused the leak. During the incident the reactor was "maintained at nominal full load".

DUNGENESS

● The Dungeness Magnox reactors had to be closed down during the storms of 16 October not, as has been widely reported, because of grid failures, but because the system frequency was increasing, causing the generators to run too fast.

● Plans to expand a runway at Lydd airport, which passes only 850 yards from Dungeness, are causing local concern. The airport authority told SCRAM that the extension will not take the runway any closer to the station. The CEBG said, however, that they are "considering the implications for the A, B and possible C stations."

TRAWSFYNYDD

● The recent rash of low flying aircraft crashes has raised fears about the safety of Trawsfynydd, in Snowdonia national park.

Local press reports, that RAF jets regularly buzz the station, did not receive much attention until August, when the CEBG disclosed that aircraft breach the plant's avoidance zone as much as once a month.

Although the jets are not supposed to fly lower than 300 feet, they often fly as low as 100 feet.

Trawsfynydd is 150 feet high and jets regularly fly up the valley, "obviously targeting on the power station" according to local residents.

HEYSHAM

● Reactor 2 at Heysham suffered a scram on 10 October, because of a fault on the main electrical system. The reactor was down for a week before the fault was mended.

FRANCE

● One of the PWRs at Tricastin in south-east France suffered a loss of coolant during its statutory five year overhaul in late August.

USA

● Safety violations and worker exposures have been revealed at the US Government's nuclear weapons reactors, in a draft Congressional memorandum obtained by the New York Post.

One of its findings is that workers at the 'N' reactor, at Hanford in Washington state, were deliberately exposed to maximum allowable radiation doses. This contravenes Federal policy that worker exposure should be kept as low as reasonably achievable. Also at Hanford, radiation alarms were turned off in a high level waste store, because they were being set off by high winds.

● Over 3,000 "mishaps", including 678 scrams, occurred in US nuclear power plants during 1986, according to a new study from Public Citizen, a US consumer organisation. Over the year, fines totaling \$4 million were imposed for a variety of management lapses.

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.

Torness



John Ogilvie

FIREMEN FOIL FICTITIOUS FLASK-FIRE FLAMES - SHOCK!

Firemen gave anti-nuclear and NUM pickets the 'thumbs-up' on their way to the latest SSEB flask test farce.

Despite the damp and dreary morning, the protesters were out in force and had a fine time - more than can be said for the watching media people.

This was a shame, because the SSEB press officers had arranged the spectacle for maximum publicity.

After spending two hours in the pouring rain, waiting for the radiation monitoring teams to travel the short distance from Torness, the media folk were well and truly browned off, and it showed in the

next days papers!

Not only was there no fire, but the flask was a fake as well. Not that this worried the firemen, who happily poured water everywhere.

So what was the point of the exercise?

The SSEB say it was to test the emergency services in case of an accident to a spent fuel flask on its way from Torness to Sellafield.

So why test it in a marshalling yard and not on the railway line in the outskirts of Edinburgh?

Well, according to a policeman at the test: "We just don't have the personnel to cope!"

Licence Row

After the Three Mile Island accident, the US Nuclear Regulatory Commission (NRC) decided that it would be a condition of future operating licences that there should not merely be an evacuation plan, but the relevant local authority should also approve the plan.

The evacuation plans for both Shoreham on Long Island and Seabrook in New Hampshire have been declared inadequate by at least some of the local authorities concerned. The NRC have, therefore, been unable to give the two long-since completed nuclear stations an operating licence.

The NRC now realise they made a mistake in 1980, when they gave local interests such a powerful voice, and are attempting to take back the responsibility for deciding whether operators' evacuation plans are adequate. Unfortunately for them, this decision could well be challenged in the courts. With an election coming up, the owners of the two plants are reconciling themselves to the further postponement of commissioning.

Union News

Abolition of nuclear power in West Germany would not cause any employment problems, according to a recent report commissioned by the West German trade union OTV.

The findings of the report, "Alternative Employment Opportunities for Nuclear Power Workers", have angered pro-nuclear members of OTV who described them as "totally unrealistic". They are particularly irate because the report's author, Professor Wolfgang Pfaffenberger, was chosen to produce a suitably biased report by the unions pro-nuclear energy specialist Karl Hoffman. Pfaffenberger concludes that "the employment argument is no argument at all".

Industry claims that a nuclear phase out would entail over a quarter of a million redundancies. However, Pfaffenberger states that only two areas would experience problems. Workers in Grohnde and Wurgassen might have move south to find alternative employment.

OTV, which have over 100,000 members in the nuclear industry, is divided on the nuclear issue. However, a majority of the 61 member executive favour a change to non-nuclear power sources as soon as possible.

● In the UK, the National Union of Mineworkers (NUM) research department have produced a report entitled "The Sale of the Century: Privatising Power". The report concludes that 100,000 jobs in electricity, coal, rail, sea and power engineering will almost certainly be lost as a direct result of privatising the electricity industry. The knock-on effects would produce an additional 70-100,000 job losses. Contact: Dave Fycart, NUM, St James House, Vicar Lane, Sheffield, S1 2EX.

Malaysia

Contempt proceedings have been filed against the Malaysian company, Asian Rare Earth, (ARE), for allegedly dumping radioactive wastes from their factory near Ipoh.

The proceedings were brought by eight local residents for alleged contempt of an injunction granted to them by the Malaysian High Court in 1985 (SCRAM 52). The original injunction restrained ARE from producing, storing and keeping radioactive wastes at their factory in such a manner to cause the escape of radioactive gases.

The ARE factory is in the village of Bukit Merah, some 45km from Ipoh, in the province of Perak. The factory processes monazite from tin tailings, to produce Yttrium. Radioactive Thorium Hydroxide, which has a half-life of over a million years, is a by-product of the process.

The contempt proceedings are being brought on the advice of Mr Justice Peh, who presided over a previous, week long, action brought by the same plaintiffs in early September.

During this hearing ARE admitted that they are continuing to operate the factory, but insisted that they are doing so with a licence from the Atomic Energy Licensing Authority. ARE argued that the 1985 injunction is a "qualified injunction to restrain production if it is not safe".

The plaintiffs, however, produced evidence showing that the waste is still being stored on site in inadequate containers. They also stated that following a visit by Rosalie Bertell to the factory on 10 April, she asserted that it was her "professional opinion the ARE debris and radioactive gaseous releases were still producing a hazard off-site for residents using the public road near the plant or those who live or work nearby".

The contempt proceedings are due to be heard from 9-14 November.

Proliferation

The BNFL-led consortium: British Nuclear Technology, (BNT) is negotiating to export reprocessing technology, in contravention of the Non Proliferation Treaty.

Reprocessing of nuclear fuel is a vital step in the production of weapons grade plutonium.

Formed to exploit the international market in reprocessing and waste management (SCRAM 61), BNT sees the American military, who want to increase their plutonium production, as forming an important part of this market. The same technology will be made available to countries who do not possess nuclear weapons.

In 1978, the Labour Government sited non-proliferation as a justification for building THORP at Sellafield. Dr Owen, then Foreign Secretary, told the Commons that extra reprocessing plant should be limited, "the best way to do that is to remove the incentive for the their construction by offering the services of our own expanded plant, particularly to non-nuclear weapons states". Now that THORP is nearing completion, the members of BNT want to exploit the experience they have gained in building and designing the plant.

BNFL are already progressing to the contract stage on two deals, with West Germany and Japan. Although these projects will remain with BNFL, future enquiries will be directed to BNT.

During the seventies the nuclear weapons states agreed to "exercise restraint" in the export of "sensitive" facilities and technology, including reprocessing. Although BNFL and BNT claim that all contracts will be subject to government approval, it is unlikely that they will find many customers unless the Government abandons a major plank of its non-proliferation policy.

News in brief

URENCO COURT CASE

URENCO and the Dutch Government have been given until 1 December to prepare their defence in the case being brought against them in The Hague.

The case, being brought under UN Decree number 1, for allegedly processing Namibian uranium, could have important consequences for BNFL who, as well as having a part share in URENCO, admit to processing Namibian uranium.

NIREX DOCUMENT

The NIREX consultative document on the siting of a repository for low and intermediate level nuclear waste will be published on 12 November.

Copies of the document will be available from NIREX, Curie Avenue, Harwell, Didcot, Oxfordshire.

DAYA BAY FAULTS

Construction faults have halted work at China's Daya Bay nuclear power station.

Fewer than half the required metal reinforcing bars were used in the station's foundations. Claims by the builders that this problem can be rectified at a later date have been met with scepticism in nearby Hong Kong. Objectors to Daya Bay point out that such an elementary fault calls into question the ability of contractors to adequately complete more complex parts of the reactor.

SPANISH WASTE

Spain has abandoned all plans to build an underground waste laboratory in the Salamanca region, following Portuguese opposition and particularly virulent local protests.

Finnish Nuclear Power

About one third of Finland's electricity consumption is provided by nuclear power, more than from any other single source, and this comes from only 2 power stations. THOM DIBDIN reports on his visit to Finland this summer, concentrating on the Soviet-built reactors at Loviisa in the south of the country.

Finland has four commercial reactors, at two coastal sites. One on the island of Hastholmen near Loviisa, about 100 km east of Helsinki, which is run by the Finnish state electricity board IVO. The second, at Olkiluoto some 220 km north-west of Helsinki, is run by a private concern, the Industrial Power Company, TVO.

The two reactors at Loviisa, are Soviet built 440MW VVER's, the Soviet's export model of the Pressurised Water Reactor. They are the only examples of this reactor type outside the Eastern Bloc.

What makes Loviisa fascinating is that IVO have tried to ameliorate the inherent structural problems of the VVER by encasing the reactor internals in a complex of Western designed and built safety systems. Altogether seven different countries helped design and build the station, adding on five independent systems.



Loviisa reactor 1 pile cap

There are two extra emergency coolant injection systems (one passive, the other active); coolant escaping from the lower part of the reactor hall must pass through a system of Westinghouse designed ice condensers; in the upper hall, a spray system is designed to further reduce the temperature and pressure of any leaking coolant, as well as washing out radiation; finally, in a modification which is unique to Loviisa, spark plugs in the upper hall are constantly removing the hydrogen, produced by radiolysis within the reactor.

This may sound very impressive to tourists on a day trip round the site; they are given the impression that the worst danger is from thermal pollution. Indeed, Loviisa may, as claimed, be

safer than other VVERs such as the notorious Kozloduj station in Bulgaria, but the inherent problems remain, and are compounded not only by the increased complexity of the plant, but also by oversights and mistakes made during construction.

The real problem is the nature of the accident with which these systems are designed to cope: total failure of only one of the six coolant inlet pipes. Recently discovered faults in the reactor pressure vessel indicate that this is not the worst accident possible. IVO have taken only superficial steps to repair the faults.

Cracks have been discovered in the steel lining of the pressure vessels, even though IVO were able to inspect them during construction in the USSR. While IVO claim that this "should not cause any problem", any reduction in the integrity of this vital part of the reactor is potentially catastrophic.

Another major worry is embrittlement in the steel pressure vessel, caused by greater than expected neutron bombardment. IVO are taking this more seriously, not only because of the safety implications but mainly because it could reduce the working life of the reactor. Of the 349 fuel assemblies, the 36 outermost have now been replaced with steel assemblies, to reduce the neutron flux.

Domestic Finnish electricity demand is highly dependent on the time of the year; the summer's requirements are only a quarter of the winter's. Because of this, the fuel cycle at the station was designed to be precisely one year, with refuelling taking place during the summer. However, the reduction in the number of fuel rods has made the already sensitive fuel management equation even more delicate, as IVO attempt to maintain full output from the station.

As well as design problems, Soviet involvement in the construction of Loviisa has caused its own difficulties, notably in the pressure circuit pipework. According to Knut Rosendahl, an ex-worker at the station, pipe joints in the circuit were not sleeved, as they should have been, but were merely welded together. Furthermore, the Russian construction workers were used to lower standards than stipulated by IVO.

Rosendahl alleges that as well as allowing the Russian workers to work to these lower standards, the safety controllers at the site took bribes from Finnish companies who provided substandard equipment, in particular pipes made with normal, not stainless, steel. If this is true, then it casts doubt on IVO's claim that Loviisa has been "brought up to Finnish safety standards". All these difficulties, and

| Procurement and consumption of electricity, GWh | | | | |
|---|--------|--------|--------|-----|
| | 1984 | 1985 | 1986 | % |
| Total generation | 44 928 | 49 390 | 48 899 | |
| Consumption at power plants | 1 702 | 2 074 | 2 015 | |
| Generation | 43 226 | 47 316 | 46 884 | 88 |
| Hydro power | 13 115 | 12 211 | 12 267 | 23 |
| Back-pressure power | 10 399 | 12 113 | 12 424 | 23 |
| Nuclear power | 17 799 | 17 990 | 18 011 | 34 |
| Other condensing power | 1 907 | 4 874 | 4 068 | 8 |
| Other base-load power | 16 | 135 | 110 | 0 |
| Peak and reserve power | 0 | 3 | 3 | 0 |
| Imports | 5 637 | 5 608 | 6 275 | 12 |
| From the Soviet Union | 4 086 | 4 203 | 4 650 | 9 |
| From Sweden | 1 551 | 1 405 | 1 625 | 3 |
| Total supplies available | 48 863 | 52 924 | 53 159 | 100 |
| Exports to Sweden | 422 | 881 | 482 | |
| Total use | 48 441 | 52 043 | 52 677 | |

more, remain a problem for IVO.

VVER fuel is produced in the USSR and IVO have negotiated a contract whereby the spent fuel is returned there. While this means that the high level waste problem at Loviisa has been essentially "solved" for IVO, this further dependence on the Soviets has created its own problems.

IVO have no access to the fuel fabrication plant. Indeed, they do not even know where the plant is. This has meant that several sub-standard fuel rods have been supplied which have leaked inside the reactor. As yet, none of these have been returned, but, according to IVO, once enough rods have been discovered to fill a spent fuel flask (30 rods), they will be sent back.

PRIVATE NUCLEAR POWER

Apart from running Loviisa, IVO also have a 20% share in TVO. TVO run the two Swedish built Boiling Water Reactors at Olkiluoto. Shareholders in TVO do not receive any dividends, but instead are supplied with cost price electricity, commensurate with their share in the company. Finland's major industry, wood and pulp production, hold most of the shares. As these pulp companies move to more energy dependent processes, using fewer chemicals, they are becoming increasingly vocal in their support of nuclear power. Environmentalists point out they are merely replacing the problem of chemical pollution with radioactive pollution.

Uranium for Olkiluoto comes from Canada and Australia, is turned into uranium hexafluoride in Canada and France, enriched in the Soviet Union and fabricated into oxide fuel in West Germany and Sweden. TVO have recently signed a contract to purchase 600 tonnes of yellowcake from China over 7 years. Spent fuel is currently stored on site, pending a decision on a future final repository. This decision is causing a wide ranging political debate in Finland, although the Government seem to be handling the affair with rather more *glasnost* than in the UK.

On the surface, nuclear power in Finland appears to be "clean and safe" but, beneath the veneer, their nuclear industry is no better than any other. Their attitude to Chernobyl, as well as the problem of nuclear waste, exemplifies this. Chernobyl, the waste debate and the anti-nuclear movement in Finland will be covered in the next issue of SCRAM.

Hinkley C – The Campaign Begins

After a quiet summer lull, the heat is now on in Somerset as the CEBG attempts to proceed with a second PWR at Hinkley Point on the Bristol Channel. CRISPIN AUBREY of SHE (Stop Hinkley Expansion) describes the current state of play.

On 27 August, the CEBG officially submitted its expected planning application to build a PWR at Hinkley Point, known as Hinkley C. Whether they make any progress depends in part on national factors, including the privatisation of electricity supply, but also on how fast the growing opposition in the South West can be developed.

The new reactor would join the line of stations facing across the sea to South Wales, and within 20 miles of both Cardiff and the outskirts of Bristol. The Severn estuary would have a total of ten reactors, the highest concentration anywhere in Britain.

The mechanics of the planning procedure are these. Objections to the new reactor must be sent to the Department of Energy before the end of November. The two local authorities directly affected – West Somerset District Council and Somerset County Council – are also asking for representations. These will in turn be passed on to the DoEn. At the same time, a consultation process has been started by the two councils, with a series of public meetings and invitations to comment going out to organisations in the region. This will continue until the end of the year.

The public enquiry is expected to be held in Taunton, the county town, either in the Spring or Autumn of 1988. The DoEn, with the CEBG at its shoulder, is pushing for the spring, the fastest timetable, the County Council for the Autumn – in order to give it time to prepare its case.

One crucial difference between Sizewell and Hinkley Point is the fact that the County Council is a serious objector. A policy was passed in the wake of Chernobyl which committed the Liberal-led authority to oppose a PWR. A budget of £250,000 has been set aside for its case at the public enquiry, and consultants are in the process of being appointed.

One uncertainty, however, is precisely what the 'terms of reference' of any Hinkley enquiry will be, especially after the Suffolk marathon. The CEBG and DoEn are understood to be still keen to keep these as narrow as possible, ie 'site specific', to use the jargon. The County Council wants to raise much more, including the whole economic debate. Stop Hinkley Expansion (SHE), as the main local pressure group, is also involved in lobbying to ensure that as many as possible of the critical issues, from safety through to health effects, are given a proper platform.

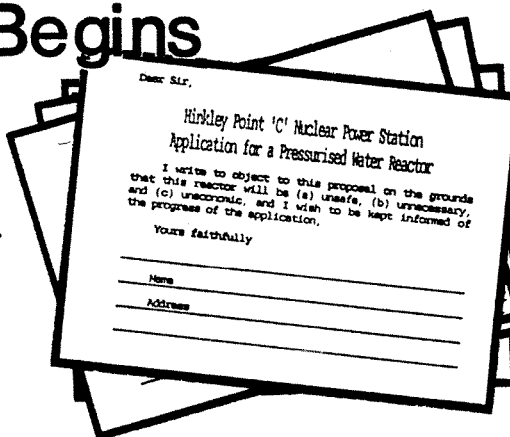
Two 'site specific' issues have meanwhile developed their own head of steam – the routes of new roads

which the CEBG needs to bring in construction traffic, and where to put a workers' hostel to house 400 single building workers expected to arrive. The latter are seen as a potential hazard in a small rural community, the former as a threat to local people's peace (and property values). No solution has yet been found to either.

The CEBG has been desperately throwing money at these problems, with every village in the area hoping to get a windfall of at least a village hall. Local councillors have been flown up to Torress to see the 'palatial' hostel, and came back saying they would love one. Next month they are going on a similarly expensive trip to see a working PWR in France. The CEBG hopes they will come back loving that as well. There has also been a flood of glossy brochures on the new station and a travelling exhibition.

SHE is responding on several fronts. Thousands of objection postcards have been printed – one enclosed with this magazine – although a letter to one of the addresses at the end would be even better. We're also sending out our own leaflets to as many organisations as possible, and even preparing our own Safe Energy Roadshow to counter the CEBG's mobile unit. Discussions are also continuing between all organisations which may be interested in being represented as objectors at the public enquiry.

Strong support for SHE continues to come from Wales. Dyfed and West Glamorgan County Councils are the latest to signal their stand as



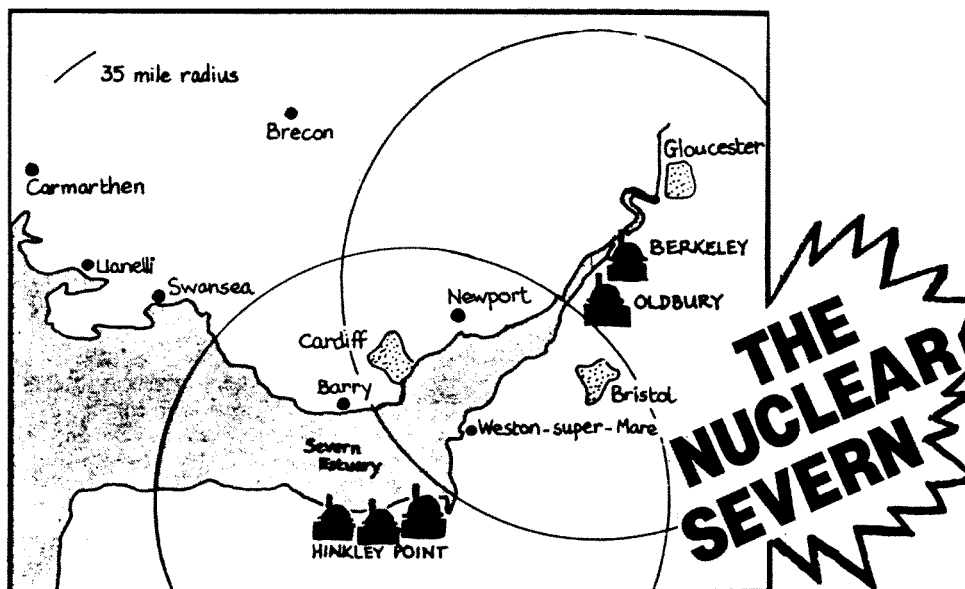
objectors to Hinkley C. A recent straw poll in the daily South Wales Echo produced a 13 to 1 vote against the PWR.

We have also found a new advocate in one Walter Marshall. The Lord managed to ensure more enemies in Somerset by promising on the recent 'Brass Tacks' BBC2 nuclear power series that the CEBG were 'going to be working on the Hinkley site virtually for ever'. Hopefully, this was just a reference to the time it will take the Board to bury its previous mistakes.

Objections to the Hinkley Point C PWR should be sent to:

- 1) Department of Energy,
Electricity Division,
Thames House South,
Millbank,
LONDON,
SW1 4QJ.
- 2) West Somerset District Council,
Killick Way,
Williton,
Taunton,
Somerset.

More information from Stop Hinkley Expansion c/o Hockpitt Farm, Nether Stowey, Bridgewater, Somerset, TA5 1EX. Please send a small donation to cover postage costs.



Map shows the Severn Estuary with nuclear power stations and line marking the 35-mile radius within which tests are made for radiation.

Magnox - Are They Safe?

The NII long term safety review of Bradwell, published in July, called for 17 key areas of reactor safety to be overhauled. The next review, of Berkeley, is expected to call for similar work when it is published next year. JAMES GARRETT looks at the history of the station, and describes local fears that it may be responsible for two leukaemia hotspots.

The world's first commercial nuclear power station, at Berkeley in Gloucestershire, was ordered in 1956. It was due to have been in operation by 1961 but electricity didn't start flowing into the National Grid until 12 June 1962 - 15 months late.

The generating cost when it started up was 0.51p a unit, compared with 0.2p for the Central Electricity Generating Board's (CEGB) latest coal-fired station. The original tender was just under £150 per kilowatt of output. By early 1962, the cost had reached £167/kW.

In 1962 the then Chairman, Lord Hinton, told the House of Commons Select Committee on Nationalised Industries, "The costs which are being achieved on Berkeley and Bradwell are well above the costs which were estimated when both those stations were put in hand." Nowadays, however, the CEGB insist that Berkeley is "very, very profitable indeed."

Since 1962 Berkeley, like all Britain's nuclear stations, has had a mixed career. Deputy manager Dennis Joynson says, "It has had quite a robust history. It is a little bit like some of the older motor cars. It might have lacked some of the bolt-on goodies, but it was very solidly engineered."

However, older cars are no more immune from accidents than new ones, and Berkeley's no exception. Reactor 1 was shut down in March 1980 after cracks were discovered. It started up again 18 months later but had to shut down again for repairs in February 1984, after 16 months on reduced output. The closure cost the CEGB tens of millions of pounds in lost power.

LEUKAEMIA HOTSPOTS

Paddy Ashdown MP says "the level of dosage received by some members of the public outside the Berkeley site is about 12 times the NII (Nuclear Installations Inspectorate) assessment level appropriate to new power stations." And Berkeley has been unable to shake off the belief in many minds that it's responsible for two nearby cancer clusters.

Northavon District is one of Britain's top 20 leukaemia hotspots. In 1984 12 people died of the disease, while there were a further 7 deaths in 1985; this compares with the national average, of just 3.9 cases a year.

The District Council decided there was no evidence to link the deaths with two obvious local sources of radiation, Berkeley and Oldbury nuclear power stations, but added it wasn't possible to rule out a nuclear link.

The other cluster is around Lydney, immediately opposite Berkeley and Oldbury, on the other bank of the Severn. Between 1979 and 1983 6 children under the age of 7 were diagnosed as having leukaemia or Hodgkin's Disease. In 1980 there were 12 cases of leukaemia or lymphoma among adults in the area - only 3.5 were expected.

Once again accusing fingers were pointed at the two nuclear plants, especially after those campaigning for a public inquiry into the phenomenon found that radioactive discharges into the river had been far higher than normal in 1976 and 1977 - about the time when the sufferers might have initially contracted the diseases.

Severnside Campaign Against Radiation (SCAR), understand that 1976 was the last time Berkeley's cooling ponds were emptied into the Severn. This was the year of the last great drought, when many children played in the river, which was reduced to a trickle. With so little water, it would have taken a long time for any radioactive materials dumped to be washed out to sea.

The CEGB have since denied that their officials admitted the ponds were emptied into the river. However, SCAR spokesperson Brian Howison says, "The way the cluster has arisen, with no cases before and no cases after, seems to suggest an event. I wish I could prove this is what happened. It would give us reassurance, as long as they didn't go and do the same thing again."

The CEGB intend to keep Berkeley running until 1992, when it'll be 30 years old. That of course depends on the outcome of the long term safety review being conducted by the NII. Already years late, the Inspectorate still can't say when it'll be published. The best estimate they can come up with is "early 1988."

Berkeley's managers are expecting

the NII to call for a number of improvements, most of them similar to those demanded at Bradwell. They have set aside £5 million to cover the cost of the work likely to be demanded.

Mr Joynson says, "Most of us would be very surprised if either of those stations stopped generating before 1992. I am optimistic that we can satisfy the NII that Berkeley can be licensed for a further period of operation."

OLD SAFETY PRINCIPLES

The CEGB is lucky that the Inspectors won't be judging Berkeley's present performance against modern safety standards. Instead, they'll be comparing it with the safety principles of the plant when it was constructed. Berkeley wasn't built to withstand any kind of seismic shock, even though that's now a key safety issue.

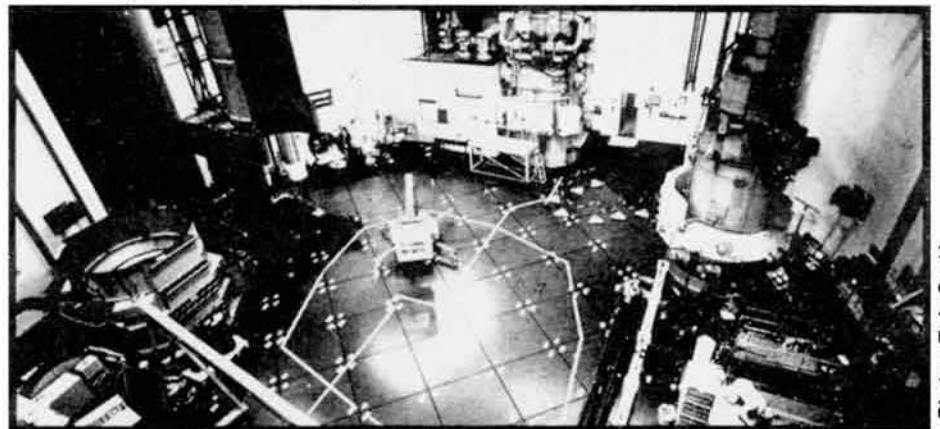
The current publicity brochure, published in 1984, describes the station as having achieved a lifetime load factor of 67%. Mr Joynson described this as "respectable by any measure. By the time you take into account statutory shutdowns which are a little longer on a nuclear station than a conventional station, it is quite respectable."

Asked how a station which started life by producing electricity more than twice as costly as coal-fired stations can now be "very, very profitable indeed," Mr Joynson suggests the increase in the station's expected life from 20 to 30 years is responsible.

Berkeley will of course have to close one day. The CEGB still don't know how they'll demolish the 25 year old plant. Mr Joynson says, "The inventory of radioactive materials is still being refined."

It's expected to take five years to remove all the fuel rods from the reactor, and anything up to a further 20 years to clear the rest of the site, restoring it to a green field.

Or will it? One option being canvassed, although the Board say they aren't taking it seriously, is that the world's first commercial nuclear power station should be 'turned into a museum. But what would it commemorate?



Reactor 2 at Berkeley

Photo: Rob Scott

Energy Review Continues

Although this year's TUC Congress voted heavily against an anti-nuclear motion, their on-going nuclear energy review body could not be described as an uncritical friend of nuclear power. MIKE MALINA reports on the background to the TUC's nuclear debate.

To understand the debate at this year's TUC Congress requires a fair amount of background knowledge. Up to the 1985 congress, the TUC had always been pro-nuclear in their outlook, largely because most of the unions in the electricity supply industry were strongly supportive of nuclear power.

In the early 1980s, the number of unions expressing concern about nuclear power gradually increased due to the successful lobbying campaigns of Greenpeace, FoE, and most of all SERA (the Socialist Environment and Resources Association) which had built up a network of contacts in anti-nuclear unions. This culminated in the famous nuclear debate at the 1986 Congress which was noted for its length, its vigour and the closeness of the final vote. In the vote, the strongly worded anti-nuclear motion moved by the Fire Brigades Union lost by a mere 60,000, a whisker since the total vote amounts to 9½ million.

TGWU POLICY SWITCH

The narrowness of this vote surprised many observers and the TUC: anti-nuclear unions included the TGWU (transport workers), NUM (miners), NUJ (journalists), NUPE (public workers), SOGAT (print), COHSE (health workers), USDAW (shopworkers), UCW (post office). It became quite clear that following Chernobyl, many unions outside the nuclear industry had said to unions within the industry: "enough is enough." This is a surprising and welcome development in the TUC, as in the past accepted wisdom among

unions was that they would not criticise each other's 'patches'.

But on to 1987. Prior to Congress, in July 1987, the TGWU's Biennial Delegates Conference suddenly changed from being anti-nuclear to having no policy on the issue. This was very bad news because the TGWU, with 1.3 million members, is the largest union in the TUC and its vote is crucial in the TUC debates. The reason for the TGWU's change of policy is difficult to ascertain given the murky deals and horse-trading which occur at every union conference. But what seems to have happened is that the Broad Left faction in the TGWU agreed to drop their anti-nuclear motion if the BNFL workers dropped their pro-nuclear motion and their threats to resign from the union.

At the 1987 Congress, the TUC presented a report on nuclear power which still favoured a moratorium, called for the review to continue, and for both sides to support the continuation of the review. The AEU (engineers) responded to this and dropped their pro-nuclear motion, but Arthur Scargill (NUM) persisted with his union's call for the phasing out of nuclear power. Given the TGWU's refusal to support this line, Scargill's call was doomed to failure and so it proved to be; the Scargill motion was heavily defeated.

PRIVATISATION WORRIES

The nuclear debate this year was a pale reflection of last year's impassioned exchange for a number of reasons. First, with the TGWU

changing tack, the result was a foregone conclusion, and second, Chernobyl was a more distant memory. But most important was that the Labour Party had lost its third election in a row, and many delegates, including Ron Todd, General Secretary of the TGWU, realised implicitly that for the next four years it didn't really matter whether the TUC or TGWU were pro- or anti-nuclear: Thatcher would be going her own way.

It is also probable that some union delegates realised that the arguments were moving on and that privatisation would provide a much stronger and more ideological threat to the nuclear industry than union opposition. But that, as they say, is a different story.

ALL IS NOT LOST

However, all is not lost with the TUC, as a close examination of their report reveals that an increasingly critical attitude is being taken towards the nuclear industry. For example, they not only oppose Sizewell B, but also Hinkley Point C and the EDRP at Dounreay. It welcomes the ordering of two coal-fired power stations - and states that there is a strong argument for retiring the older magnox stations (ie all except Oldbury and Wylfa) when the two new coal stations are built.

A summary of the TUC recommendations is contained in the box. An analysis reveals that the TUC is considerably more critical of the nuclear industry than the Scottish TUC, which earlier this year voted both ways on the issue - they supported Torness and Hunterston B but opposed the Dounreay EDRP and called for the closure of Chapelcross and Hunterston A. The TUC Congress in 1988 will be the key to any future energy policy for the Trade Union and Labour Movement.

SUMMARY OF 1987 TUC NUCLEAR ENERGY REVIEW BODY RECOMMENDATIONS

- | | | |
|---|--|--|
| 1 The Review Body should continue for another year. | alternative employment programme in consultation with the trade unions. | 12 The Government should publish their review of emergency plans to deal with nuclear accidents. |
| 2 The policy of a moratorium on new nuclear installations should continue. | 7 A vigorous energy conservation programme should be a major priority for any Government. A publicly funded lead city programme of combined heat and power should be instituted. | 13 Further steps must be taken to improve radiological protection for nuclear plant workers. |
| 3 It is premature to order Sizewell B, Hinkley Point C and EDRP. | 8 The TUC is strongly opposed to the privatisation of the electricity industry. | 14 Work on leukaemia clusters must be accelerated. |
| 4 TUC welcomes the two new coal-fired stations, but regrets that Fawley is not in the British coalfields, and would support a larger ordering programme with advanced environmental controls and combustion technology, using British coal. | 9 A National Energy Commission should be set up as a focus for an active public debate about energy policy. | 15 Sea dumping of nuclear waste and the Drigg low level dump are no longer publicly acceptable. All wastes must be stored in a monitorable and retrievable form, until high quality long-term solutions which inspire public confidence are found. Government should initiate a wide public debate on nuclear waste. |
| 5 Retire older magnox capacity when the new coal stations are ready. | 10 The Health and Safety Commission should undertake a thorough review of nuclear safety. | 16 Transport of nuclear materials should be subject to a safety review. |
| 6 Major shifts in energy policy should be accompanied by an | 11 The NII must be expanded. | |

US Waste Mess

The problem of nuclear waste management is different in the United States to that in this country, mainly because they no longer reprocess civil spent fuel. Disposal of the waste is just as intractable, however, in the US as it is here. In the first of two articles, PETE ROCHE looks at the high-level waste problem in America. In the next issue he will look at "low-level" waste.

By 1982 it was clear that there was not going to be a civil spent fuel reprocessing programme in the US. In that year Congress passed the Nuclear Waste Policy Act (NWPA), the result of much effort and compromise. Discussion involved: states, indian tribes, the nuclear industry, the Department of Energy (DOE), and the environmental community.

The NWPA attempted to be even handed on a geographical basis so that the West and East would share the burden of nuclear waste disposal, and in so doing it was hoped to remove the danger that politics would interfere with the mission of safe nuclear waste disposal in a technically safe geological repository.

The utilities signed up for a plan to develop fuel burial sites and a temporary holding centre. The latter is known as a "monitored retrievable storage" (MRS) facility. Between them they have paid \$2.8 billion into a fund managed by the DOE in the expectation that the facilities would be built as promised and their nuclear waste problems would be taken care of.

Five years after the NWPA, the federal programme is on the verge of technical, legal, and political collapse. Representative Morris Udall, the originator of the existing waste programme has claimed that "after billions of ratepayers money have been collected and hundreds of millions of dollars spent the programme is in ruins and our goal of siting a repository seems further away than ever."

MISMANAGEMENT

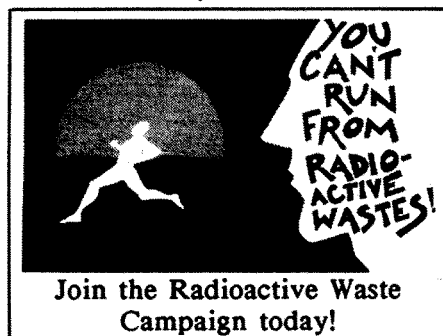
Critics say that the DOE mismanagement and misguided emphasis on a quick solution has resulted in politics taking precedence over scientific considerations leading to the selection of first and second repository sites which appear technically unfit for the purpose. There has been inadequate consultation and co-operation. On top of all this the proposed MRS facility is seen as unnecessary.

After initial site screening the DOE announced on 28 May 1986 that it had three candidates for the first repository (Hanford, Washington; Yucca Mountain, Nevada; and Deaf Smith County, Texas). Exploratory work was to begin shortly afterwards to determine the suitability of each site. But Congress intervened in summer 1986 to block funding for site preparation.

Congress were particularly annoyed that Hanford had been chosen. The

DOE have owned land there since 1943 for its weapons production plant, and the site is already contaminated making it difficult to trace any leaks from the new repository. Also the site is bounded on two sides by the Columbia River, which is a source of drinking water.

The gaffe was compounded when the DOE announced at the same time that they were suspending the search for a second repository in the East, claiming that they were trying to save money and that the fall off in nuclear construction had removed the urgency. Cynics suggested that the real reason was that the Administration wanted to help Republicans in the East who were feeling threatened by the nuclear waste issue. They claim that the DOE



were trying to drive a wedge between states affected by the nuclear waste programme. States with powerful delegations in Congress were taken off the nuclear waste hook, while those with weak delegations were prepared for sacrifice.

Anti-nuclear groups are also highly critical of the proposed MRS. The MRS would handle two kinds of nuclear wastes - irradiated fuel from commercial reactors and high-level wastes from weapons production. Irradiated fuel is currently stored in reactor storage ponds, and high-level liquids are stored in tanks at DOE facilities at Hanford and Savannah River (South Carolina).

The MRS facility would be constructed at the abandoned Clinch River Breeder site near Oak Ridge, Tennessee, where the irradiated fuel assemblies would be taken apart and the fuel rods packed closer, a process known as consolidation. This would be done using remote handling techniques. The consolidated fuel would then be placed into large concrete storage casks for above ground storage until a geological repository is established.

The DOE have chosen this option because the NWPA sets 1998 as the date for acceptance of irradiated fuel for disposal at a repository. MRS would solve this problem and create

the illusion that progress was being made in the search for a solution to the nuclear waste problem.

The proposed MRS has parallels with the proposed buffer store at Chapelcross in this country. American anti-nuclear groups, are proposing on-site storage to minimise the dangers involved in transporting spent fuel to a centralised store. The Americans, however, would have the added problem of consolidation which is at an early stage of development, and may prove to be impractical due to the risks to the workforce and the environment. Dry storage of unconsolidated spent fuel assemblies may prove to be the safest and most economical method. The DOE could fulfil their commitment under the NWPA by accepting title to the waste and leasing on-site storage space from the utilities.

FINANCIAL INCENTIVES

The repository programme received yet another setback from the Courts in July this year. The Court of Appeal found in favour of three environmental groups against the Environmental Protection Agency (EPA). EPA regulations, which set limits on how much radiation may be released into the environment from the disposal facilities, would have allowed higher contamination in groundwater than the Safe Drinking Water Act. The decision will force the EPA to set stricter standards, and may put some of the potential repository sites in jeopardy.

So now, one year later Congress must decide whether to revive the programme or continue the moratorium. One idea, which has achieved the backing of the Senate Energy & Natural Resources Committee and the nuclear utilities, is to give a large reward to any state willing to serve as a host to nuclear waste. The money saved by cancelling duplicate site investigations (\$2 billion) could be spent on incentives. The prize for a repository would be \$100 million a year, and \$50 million for an MRS.

Anti-nuclear groups support a bill being put forward by Udall in Congress which would put an 18 month moratorium on the waste repository search, and set up an independent commission to evaluate and make recommendations on the programme.

The similarities between the US and UK nuclear waste disposal programmes are striking. What begins as a scientific exercise always seems to end up as a political row. NIREX will be trying to revive their flagging waste disposal programme in the autumn with the publication of a consultation paper. While responsibility for nuclear waste disposal remains with a body composed mostly of nuclear enthusiasts it's difficult to see how a consensus can ever be achieved. Perhaps we should take a leaf out of the US anti-nuclear groups' book and demand an independent commission. Any such commission worthy of its name would have to recommend the end to nuclear waste production as a vital first step to a solution.

Juggling the Figures

Four months, after the well-publicised report by the National Radiological Protection Board, (NRPB) on the radioactive doses received by the public from Chernobyl, they finally published the appendices. DAVID WEBSTER has looked at them and asks if they were delayed deliberately.

On 25 March, the media gave extensive coverage to the NRPB's latest Chernobyl dose estimates. But not until 31 July was it possible to examine the vital technical appendices to the report. A careful reading of this material reinforces one's suspicions that the delay may not have been accidental.

The Table shows the components of the NRPB's estimates of "effective" (whole body equivalent) and thyroid first-year doses to the "critical" or most exposed groups in south west Scotland. This was one of the three most affected areas in Britain, the others being Cumbria and N.Wales. South west Scotland has a population of 146,000 and covers most of Dumfries and Galloway and part of south Ayrshire. The map shows the approximate pattern of deposition of radioactivity from the Chernobyl cloud as estimated by the Meteorological Office. By examining the published monitoring data in the light of the map, it is possible to judge whether the NRPB have made sufficient allowance for the different elements of dose which some people may have received.

Milk is by far the most important source of contamination. It has been officially admitted that people most at risk were babies and young children drinking milk from a single farm rather than from a dairy, where mixing of supplies from different sources will have produced a lower overall level of contamination. Most concern centres on thyroid doses from radioiodine.

In their "critical group" estimates,

FIRST-YEAR CRITICAL GROUP RADIATION DOSES FROM CHERNOBYL IN S.W. SCOTLAND as estimated by the NRPB

| | INFANT | | CHILD | | ADULT | |
|------------------------|---------------|----------------|---------------|---------------|---------------|---------------|
| | Whole Body. | Thyroid | Whole Body. | Thyroid | Whole Body. | Thyroid |
| All units in mSv. | | | | | | |
| Inhalation | 0.0140 | 0.1400 | 0.0180 | 0.1700 | 0.0120 | 0.0930 |
| Deposited gamma | 0.1461 | 0.1461 | 0.1461 | 0.1461 | 0.1461 | 0.1461 |
| Cloud gamma | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| Ingestion | 0.7194 | 11.0761 | 0.6990 | 5.2420 | 0.6910 | 2.5250 |
| TOTAL | 0.8798 | 11.3649 | 0.8634 | 5.5584 | 0.8494 | 2.7644 |
| Ingestion breakdown: | | | | | | |
| Milk | 0.6100 | 9.2000 | 0.4800 | 3.7000 | 0.4200 | 1.6000 |
| Milk products | 0.0540 | 1.1000 | 0.0580 | 0.7000 | 0.0610 | 0.3700 |
| Beef | 0.0190 | 0.1800 | 0.0910 | 0.4000 | 0.1200 | 0.2800 |
| Lamb | 0.0055 | 0.0094 | 0.0340 | 0.0400 | 0.0490 | 0.0490 |
| Grain | 0.0069 | 0.0067 | 0.0120 | 0.0120 | 0.0170 | 0.0160 |
| Green vegetables | 0.0240 | 0.5800 | 0.0240 | 0.3900 | 0.0240 | 0.2100 |
| INGESTION TOTAL | 0.7194 | 11.0761 | 0.6990 | 5.2420 | 0.6910 | 2.5250 |

NOTES: Doses are "committed" doses where relevant, ie they included the effect during later years of radionuclides taken into the body in the first year. The deposited gamma, ingestion and total figures are higher than those shown by the NRPB because rounding errors have been eliminated here. The figures for lamb show doses after the effect of the government restrictions has been allowed for.

adult critical effective dose is shown as 0.049mSv for S.W. Scotland, but as 0.073mSv in England outside Cumbria. The government say that the annual dose to an adult with no more than average consumption from eating lamb contaminated at an allowable maximum of 1,000Bq/kg would be 0.15mSv, three times higher than the dose shown, and that the dose to a 10 year old child with above average consumption would be 0.625mSv, 18 times higher than the 0.034mSv which is shown.

Only three samples of beef were taken in Dumfries and Galloway, so there is no basis for arguing with the NRPB estimates for the three radionuclides they considered (iodine-131, caesium-134 and caesium-137). But one of the radionuclides not considered by the NRPB may be significant for both beef and lamb: the highly radiotoxic silver-110m, which came from molten neutron detectors in the Chernobyl reactor core. This was found in beef liver from North Wales (23Bq/kg) and Dumfries and Galloway (20 to 125 Bq/kg).

Estimates previously published by the NRPB suggest that caesium alone in green vegetables at Auchencairn could give a child an effective dose of 0.52mSv, more than double that shown in the table.

Water supplies, goats' and sheep's milk, pork and poultry, venison, game, root vegetables, mushrooms, honey, fish and shellfish all had measurable degrees of contamination from Chernobyl, but are excluded from the NRPB estimates.

RAINWATER WARNING

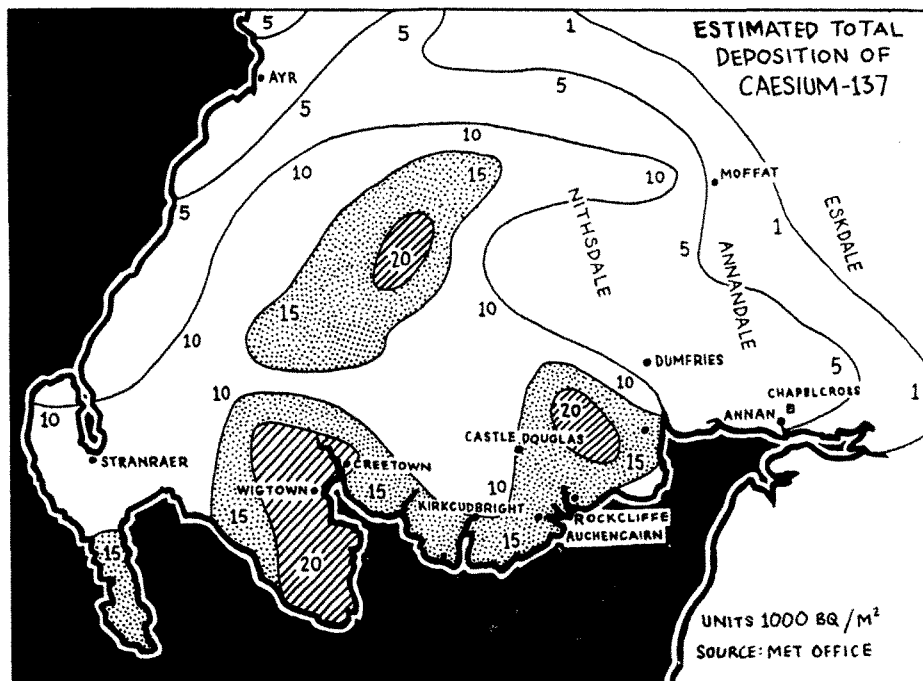
Most concern is for families reliant on rainwater for their drinking supply - not too unusual in country areas. A warning was issued, but only 48 hours after the contaminated rainfall had fallen. In the text of their report, the NRPB give an infant critical group effective dose estimate for this source of 0.32mSv, but do not include it in their "headline" total. Nor is it clear how it has been calculated. However, from other information it is possible to estimate that rainwater falling at Chapelcross could have given a thyroid dose of up to about 5mSv by the time the warning was given.

It is usually argued that other water supplies will have had too high a dilution factor for any concern to be justified. But stream intakes at New Abbey and Creetown showed iodine-131 levels of 6 and 15 Bq/l respectively, so some allowance should be made.

On 30 March the Scottish Office took the step of issuing a warning to people such as forestry and estate workers who might eat large amounts of venison. By this time, Dumfries and Galloway had already been showing the highest measured levels of radiocaesium in deer in Scotland - at up to 2,297 Bq/kg of caesium 134/137 - for several months. Eating 11lb of venison contaminated at this level would give

Levels of radiocaesium in brown trout in Dumfries and Galloway ranging up to 4,232 Bq/kg were announced by the Scottish Office on 20 October, having been kept from the public since March, when the samples were taken. MAFF estimated a possible critical group effective dose from freshwater fish of as much as 1.1mSv, on the basis of readings lower than this. Shellfish sampled at Rockcliffe were quite badly contaminated (including 3,754 Bq/kg of ruthenium-103/106). MAFF estimate a possible critical group dose of 0.084mSv.

The NRPB state confidently that their figures are likely to be overestimates, because no one would actually have had the relatively high doses they consider both from gamma



Drinking milk at the 575 Bq/l level or higher, and rainwater or groundwater from a private source, eating home-grown vegetables and consuming lamb at or near the 1,000 Bq/kg limit, with some other intakes of locally caught fish or game, and receiving a virtually constant elevated dose rate, is an entirely possible combination for such a family. Their total doses would be much higher than those shown by the NRPB - perhaps up to 20mSv thyroid, and several milliSieverts effective dose. To establish exactly how much higher would require detailed local research.

No other published tests have been made in Dumfries and Galloway, but in an article in *The Lancet* of 18 July the NRPB tried to back up their claim that they have overestimated doses in the high deposition areas by quoting average measurements of radiocaesium in a sample of human subjects in Cumbria. It turns out, however, that these human subjects are all workers at Sellafield, who are not likely to have been running farms and consuming their own produce to any great extent. Moreover, the coauthor of the *Lancet* article, Dr

Second, in any future nuclear accident we need much better direction of monitoring resources. Because of lack of co-ordination, far too much of the Chernobyl monitoring was done in areas of low deposition, leaving ridiculously small samples in areas like Dumfries and Galloway where it was really needed.

SCRAM Journal November/December 1987

Playing with Robots

The UKAEA are decommissioning the Windscale Advanced Gas cooled Reactor (WAGR), and plan to restore the land to a greenfield site. The project will take 15 years, and cost about £45 million, of which half will be borne by the taxpayer and the rest by electricity consumers. PETE ROCHE asks if they have really thought through whether this is the right method.

Conventional wisdom is that nuclear authorities have three choices when a reactor reaches the end of its operating life. They can simply withdraw the fuel rods from the core and leave the structure standing; or they could concrete over the highly radioactive core and dismantle the surrounding buildings, a process known as entombment; or they could try to dismantle and remove the entire power station. (see SCRAM 47)

One reason for completely dismantling a reactor is that the site can be used to build a new station. The site already has outline planning permission and the local population will be used to having a nuclear neighbour. But one can't help thinking that part of the UKAEA's enthusiasm for dismantling the WAGR is 'because it's there'.

Dismantling and extracting the core of the reactor is extremely difficult, because of the problems of working with building materials which have been heavily irradiated. The cutting devices, for example, have to be manipulated remotely from some distance and through several layers of insulating steel. All of this leads to enormous costs. The WAGR is considerably smaller than a commercial reactor. No one seems to quite know how much it would cost to dismantle a commercial reactor, but official figures suggest a cost of up to £330m for each Magnox station and even more for an AGR. That's at least a third of the original construction cost.

NO ILW WASTE DUMP YET

At shutdown, excluding the fuel, the activity of the WAGR reactor and pressure vessel amounted to about 7000 Terabecquerels (TBq). (1TBq = a million million Bq. The action level for radioactivity in lamb is 1000Bq per Kg). The activity will have dropped by a factor of 10 by the time they start to dismantle the core in 1991. But even after 300 years the activity will still be 20 TBq, sufficient to require remote handling techniques.

Most of the mass of the plant is inactive. About 1800 tonnes has some radioactivity. Of this 700 tonnes is classified as intermediate level waste, the remainder as low level waste.

In preparation for disposal the 700 tonnes of intermediate waste will be placed in boxes of reinforced concrete. About 150 boxes will be needed to accommodate it. (They will be 2.3m cubes). The volumes of waste that would be produced from dismantling a Magnox reactor are even more staggering. The total volume and weight including packaging

are estimated to be about 34,500 cubic metres and 24,550 tonnes.

NIREX have still not found a final resting place for Intermediate Level Waste, so the concrete coffins at Windscale have been designed to withstand any conditions including corrosion by sea, air or collision during transport. They must also last for thousands of years. Each box will cost around £3,000.

Keeping waste volumes to a minimum, during dismantling is an elusive goal. Each piece of machinery and every tool that comes into direct contact with a contaminated surface must be decontaminated or added to the radioactive waste pile.

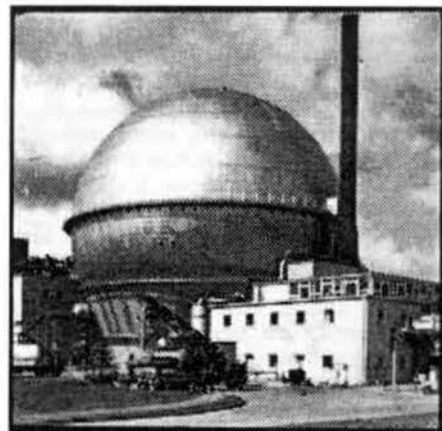
Magnox and AGR cores consist essentially of a huge construction of graphite blocks, surrounded by an even larger shell of reinforced concrete shielding. Both the concrete and graphite are radioactive. These reactors are designed to confine radioactivity within them and are more compact than they could ever be after being cut up into little bits. Dismantling the core will create large quantities of radioactive dust and liquids and disperse the radioactivity throughout the environment, making it more difficult to manage.

LEAVE THEM AS THEY ARE

Walt Patterson, an independent nuclear consultant, believes that we shouldn't be doing anything irreversible and making more kinds of waste, and removing lots of options that we might regret not having any longer.

"We seem to be absolutely determined to press on doing things that we haven't thought through. The industry are laying down policy now which won't be implemented until its grandchildren are in charge". He suggests that reactors that have come to the end of their operating lives should just be left as they are for the time being. "We're going to anyhow, so let us actually acknowledge that that's what we're doing instead of pretending that we're going ahead and decommissioning which is what the industry is pretending." He suggests that they could even be used as low-level waste stores.

Even covering the reactor in concrete would be an irreversible process that we might regret later. Greenpeace are inclined to agree that dismantling reactors now would only serve to disperse radioactivity around the environment. Philip Code says that Greenpeace's "policy is not necessarily to say what should be done in the long term, but to say what we feel is the best option for dealing



The Windscale AGR - the UKAEA's decommissioning test bed.

with the problem at the moment." As an interim solution Greenpeace would support leaving disused reactors as they are until something more acceptable has been chosen.

It's worth mentioning that the American situation is slightly different. Light Water Reactors (LWR's) are almost all steel pipework, pumps etc. and almost all hollow. If done correctly, dismantling could achieve some kind of volume reduction and you could at the same time improve the shielding of the radioactive components which are almost certainly more susceptible to breakdown over the decades than the graphite and concrete components of Magnox and AGR's. They are two quite different technologies which present different implications for decommissioning.

The UKAEA argue that the WAGR project is to acquire general experience both for the electricity boards and foreign contracts. But Walt Patterson points out that the experience will be of limited application to the Magnox reactors which will be the first to close.

DON'T DILUTE & DISPERSE

"If the UKAEA is looking for general practice in dismantling and demolishing radioactive plant, why not start with the egregious mess next door at Sellafield? If any reactors qualify for genuine and necessary decommissioning...surely the Windscale plutonium production reactors do. They will have been sitting there, entombed and deteriorating for 30 years this October."

The problem of nuclear waste disposal is intractable enough without adding to the problem by dismantling nuclear reactors at the present time. By the end of the century the Magnox reactors will have to be closed down. At present their highly radioactive contents are relatively isolated from the environment - trapped within the solid structure. Why rush to mobilise radioactivity, expose workers and remove the fragments of the dismantled reactor to some previously uncontaminated place. We must not allow the nuclear industry to continue with this policy of dilute and disperse for no better reason than they like playing with robots.

Business as Usual

The International Commission for Radiological Protection (ICRP) met in Italy, in September. Many observers had expected them to change the regulations for radiation dose limits. PATRICK GREEN explains that no change was the order of the day.

Are the ICRP an independent scientific organisation or a mouth-piece for the nuclear industry? Regular readers of SCRAM will know that their record is not impressive; they have never given the benefit of doubt to those who face the risks from radiation exposure. Erring on the side of caution in ICRP terms has meant keeping silent about atmospheric nuclear weapon testing or unnecessary or excessive exposure to ionising radiation.

The ICRP spent the first two weeks of September discussing revisions to the recommendations contained in ICRP 26 and the scientific evidence that has been produced since this was published in 1977. High on the agenda were new data resulting from revisions to the dosimetry at Hiroshima and Nagasaki.

At the start of the meeting ICRP chairperson Dan Benninon was presented with a declaration signed by over 800 scientists from around the world calling for an immediate 5 fold reduction in the dose limits for radiation workers and members of the public, and for the replacement of the ALARA principle with ALATA for regulation of radioactive discharges from nuclear installations; ie all discharges must be kept as low as is technically achievable. Dan Benninon actually stated that he was not unsympathetic to the FoE evidence for a five fold reduction in the dose limits, echoing the published statements of John Dunster that such a move was likely. (See SCRAM 60).

Many observers expected the ICRP to make some changes, the *New Scientist* stated that the ICRP were expected to increase their risk estimates at the Como meeting. Even the science journal *Nature*, which is not noted for its radical stance, published an editorial stating that the

ICRP must change the way they work.

The ICRP promised an early response to the unprecedented publicity surrounding their meeting. This was released in early October. Those who have read it might be forgiven for believing that these recent events had been a dream (Chernobyl must have been a dream because the ICRP did not refer to it once). Basically nothing has changed.

The ICRP statement notes that 75 scientists from 20 countries attended their meeting, but no mention was made of the fact that requests from environmental groups like FoE and from international trade unions to attend as observers were declined. If the ICRP are an independent organisation this refusal is hard to justify.

The ICRP accept that changes will have to be made, but not now. Their revised recommendations are not expected until 1990, and if one considers that it took nearly ten years before ICRP 26 was incorporated into law, it will be the late 1990's before ICRP 26 and the Ionising Radiation Regulations are finally replaced.

IGNORED FOE EVIDENCE

The ICRP justify this unacceptable delay by claiming that the review of the Japanese dosimetry has not yet been completed and also because their own review includes a complete re-assessment of all their recommendations, not just the dose limits and risk estimates. They do, however, acknowledge that the risks are at least two times what they claimed in 1977, but ignore the evidence presented by FoE that the risks are actually at least five times greater, in fact no mention is made of the evidence presented to the ICRP by environmental groups like FoE.

The basis of the FoE case was that an immediate five fold reduction was essential as the evidence showing higher risks is now overwhelming. This evidence actually justifies a ten fold reduction, however our case stated that the further two fold reduction should be made in a couple of years time to enable industry and the standard setting organisations to sort out the basic recommendations. Consequently there is no reason why the ICRP, could not have formally reduced the dose limits by a factor of two before it has finished its review. A two fold reduction would involve very little additional cost to industry.

However, they go on to state that the exact magnitude of the risk estimate and the dose limit is not really important anyway as the ALARA concept "should in most

situations keep the doses far below the dose limits"! This is absolute rubbish, ALARA has totally failed to reduce the annual doses of the most exposed workers, ie those who routinely receive more than 10mSv a year. Of the evidence presented to them detailing the failings of ALARA, no comment.

Even though the risks are greater than previously claimed, it is still OK to expose workers near the dose limits if necessary: "The Commission wishes to re-emphasise its views, expressed in Publication 26, that exposure near the dose limits would only be acceptable if a dose reduction is not reasonably achievable and if the practice has been found to be justified". Yet even under the old risk estimates if the dose limits represent the bounds of unacceptability, how can exposure near them ever be justified? If the risk estimates are revised upwards such a statement is completely irresponsible, at the very least the ICRP should have stated that because of the uncertainty surrounding the risk estimates exposure near the dose limit was not justified under any circumstances.

TEN DAY RULE

The declaration presented to the ICRP also called for the reintroduction of the ten day rule. This simple rule limited the X-raying of women to the ten days after the start of their period to avoid irradiating a very young conceptus. In 1983 this rule was repealed. The ICRP statement made no reference to the ten day rule. Clearly the convenience of radiologists is greater importance than erring on the side of caution.

In effect the ICRP are basically stating that it is business as usual, nothing has changed. If anyone has any previous doubts about where the interests of the ICRP lie, it must now be clear that they don't give a damn about scientific evidence or worker and public health, their only concern is for the economic well being of the radiation industry and they will do anything they can to delay changes which will mean some sections of the industry will have to spend a bit more money.

Next year the ICRP meet in Washington to discuss, once again, revisions to their recommendations. It is not acceptable to have to wait until 1990 for these, by the time they get translated into law (around the year 2000) even the dirty end of the industry, like Sellafield, will have had sufficient time to be able to comply with any new standard. If the ICRP cannot be expected to act in the interests of health protection then national standard setting authorities must be pressurised into taking action independently and before the ICRP. This means local councils, trade unions, professional, scientific, environmental, community and other groups must publically support the campaign for a reduction in the dose limits NOW.



Coal Emissions – No Easy Solution

Burning coal to produce electricity is by no means the most environmentally acceptable method of producing our energy. MIKE TOWNSLEY looks at the prospects for cleaning up coal stations but concludes that conservation and renewables offer the only, long term solution.

Coal fuelled the industrial revolution and led us up a path of exponential energy consumption. And, some in the anti-nuclear movement see the relative abundance of world coal reserves as a good reason for returning it to its former glory.

But, the widely publicised problems of acid rain and the greenhouse effect should be enough to convince anyone that like their nuclear counterpart coal fired power stations must be phased out.

However, this cannot be achieved overnight. In their 1983 report on future energy options, ERR (Earth Resources Research) describe a radical scenario - a planned 75% decrease in the UK's energy consumption between 1976 and 2025, based on a programme of increased energy generating and end use efficiency - but postulate "coal remains a significant energy source for a long time" and by 2025 its use will have been cut by over half and replaced by "benign" renewable energy plant.

Having accepted the continued use of coal fired power stations, we must turn our attention to the best ways of controlling their emissions.

A planned strategy should involve:

- retrofitting existing plant with emission control systems capable of removal efficiencies dictated by environmental necessity - greater than 80%.
- concentrated investment in energy efficiency - postponing the need for new plant.
- development of cleaner and more efficient combustion techniques.
- genuine commitment to an energy strategy based on non-polluting renewable energy sources.

Sulphur occurs in coal in organic and inorganic forms. The organic is bound into the coal matrix and is inaccessible to physical separation. The inorganic sulphur content is mainly in the form of pyrite, and is present in discrete particles. Although it is possible to remove the pyrite before combustion, current technologies have a maximum removal efficiency of 5% and are of little practical use. The organic content of coal delivered to the Central Electricity Generating Board (CEGB) is fairly constant, about 0.8%, but the inorganic content varies between 0.2% and 1.4%, giving an average sulphur content of 1.6%.

Sulphur dioxide SO_2 , an oxidation product, can be removed during burning, but under UK conditions the CEGB say it is unlikely to achieve removal efficiencies greater than 40%.

By far the best known technique for controlling SO_2 emissions economically is to "scrub" them from the plant's flue gases: Flue Gas desulphurisation (FGD). This technique can achieve removal efficiencies of greater than 90% and is widely accepted as the best method of retrofitting pollution control.

The CEGB, and most of their international counterparts, believe "there are only two widely proven FGD processes which are currently suitable for power stations with long life" - the Limestone/gypsum and Wellman Lord methods (see SCRAM 61).

SULPHUR TREATMENT

The limestone/gypsum method is a "throwaway" process in which limestone is used to neutralise the SO_2 . The product of this reaction is a very toxic sludge which can only

be disposed of in landfill, rendering the site sterile. In an attempt to avoid the sludge problem an oxidation step is added, producing gypsum which can be of marketable quality. This is the cheaper of the two methods, but creates severe "secondary pollution" problems.

Wellman Lord, however, is a "regenerative" process in which the neutralising agent is chemically treated for re-use. The product is a stream of SO_2 which can be treated to produce sulphur or sulphuric acid. This plant has a smaller "secondary pollution" effect and produces a more saleable product.

FGD is not only difficult to incorporate and secondary polluting, but it reduces plant efficiencies - a 2000MW power station incorporating the Wellman Lord system would suffer a 1.9% loss in efficiency, and would cost an extra £26m, net, per year.

Controlling the emission of nitrogen oxides (NO_x) is a much more difficult process. Nitrogen oxides are formed during combustion, most in the early stages, drawn from the organic nitrogen contained in the coal. This nitrogen can be converted to either stable molecular nitrogen or nitrogen oxides, depending on the combustion process. Some of the nitrogen oxides are formed in the furnace's high temperature zones from nitrogen present in the atmosphere.

NITRATE REMOVAL

Reducing NO_x emissions to an acceptable level requires tackling the atmospheric and organic elements separately. The organic based NO_x can be reduced by modifications to both the plant furnace and the boilers; unfortunately retrofit changes are limited, and in practice reductions of only 30% are possible using current technologies.

For high removal efficiencies it is necessary to remove NO_x from the flue gases in conjunction with combustion modifications. There are a number of systems available for flue gas denitrification, but only selective catalytic reduction is thought to be commercially viable. This process involves reducing the nitric oxide, about 95% of the NO_x , over a catalyst at 350-400°C. Since the volume of catalyst required is large - approximately one cubic meter/MW - considerable modifications to the boiler are necessary. Virtually all that is known of the extra costs of retrofitting NO_x controls is that they're not going to be cheap.

Although the above technologies are far from perfect, they appear to be the only options available for retrofitting emission control systems. It is for this reason that research must be directed towards advanced combustion techniques.

Two techniques are currently in vogue - pressurised fluidised bed combustion with combined cycle

Approximate Annual FGD Import/Exports
to a 2000 MW Power Station

| MATERIAL | FORM | Wellman-Lord | Limestone/Gypsum |
|--|-------------------|------------------|------------------|
| Imports | | | |
| Limestone | Solid | 33,000 | 300,000 |
| Lime | Solid | 600 | - |
| Caustic Soda | 47% Liquor | 32,000 | - |
| Sulphuric acid | 98% conc. | - | 2,200 |
| Exports | | | |
| Sulphur (Sulphuric acid) | Solid (96% conc.) | 68,000 (230,000) | - |
| Sodium sulphate | Solid/solution | 27,000 | - |
| Calcium chloride | 38% Liquor | 78,000 | 78,000 |
| Gypsum | Solid | - | - |
| Mixed product (recovered with fly-ash) | Solid | - | - |

* All quantities are in tonnes/annum, at 70% load factor

(PFBC/CC), and integrated gasification/combined cycle (IGCC). Both offer the possibility of higher efficiency of coal conversion and lower emissions of acidic gases. Unfortunately, neither technology is expected to be available on a commercial scale until the turn of the century.

PFBC involves burning coal under pressure in a fluidised bed surrounding the boiler tubes. Because, the boiler tubes are in direct contact with fluidised particles, a PFBC boiler can absorb much of the heat by convection, which is more efficient than the radiant and convective heat transfer a conventional boiler relies on. PFBC can also be made to operate a combined cycle - in addition to using the steam raised to operate a conventional power cycle, the pressurised products of combustion are expanded through a gas turbine to generate extra power.

PFBCs also operate at lower temperatures, than conventional plant, minimising the evolution of organic nitrogen based NOx. The evolution of SO₂ can also be cut by more than 90% by adding limestone or dolomite to the bed. This technique, although the least expensive, promotes a large secondary pollution problem - the amount of limestone required is similar to that for the limestone/gypsum Fgd.

UK research into PFBC is based at Grimethorpe, South Yorkshire. The project, a 90MW demonstration plant, was originally funded by the IEA (International Energy Agency), but they pulled out in 1984. British Coal and

the CEEGB stepped in and saved the project. The UK Centre for Economic and Environmental Development condemned PFBC as a strategic mistake, with the UK experimental plant at Grimethorpe costing the UK dearly in the future.

The principle behind gasification is to partially combust coal under reducing conditions at high pressure to produce fuel gas. This can be achieved by burning the coal in a limited supply of air/oxygen and steam. Because combustion is carried out in reducing conditions the sulphur is converted to hydrogen sulphide which is more amenable to removal than SO₂. NOx emissions are suppressed by adding moisture to the gas before burning, thereby lowering the combustion temperature.

CARBON DIOXIDE

Conspicuously absent from this article so far has been any mention of emission control techniques for carbon dioxide. There is good reason for this: no economic method of decarbonisation has ever been presented.

M Steinberg, senior scientist with Brookhaven's research division in the US, is the chief architect of the technical fix for the greenhouse effect. He has promoted the best technique so far. Originally Steinberg's process required half the electricity produced by the plant, but it has now been refined so that integrating a CO₂ recovery system would reduce the

efficiency by only about 3%.

Having crossed this first hurdle Steinberg found himself faced with huge quantities of liquid CO₂ the only economic solution to which is disposal at sea (no surprise there). The liquid becomes denser than sea water below 3000ft, and at that depth it "can be expected to form a pool of liquid CO₂ and sink to the ocean floor."

Steinberg has now, wisely, turned his attention to alternative methods of reducing CO₂ emissions: by designing more efficient power stations, and making better use of energy in industry, homes, offices and on the roads.

This article has looked only at the environmental aspects of generating electricity by coal combustion. We should also consider the coal economy and the way in which coal supplies are gained. To make coal fired power stations economically attractive it is necessary to secure the cheapest coal supplies possible: large open-cast mines, like those of Colombia, based on exploitation of land and people alike. It is interesting to note that the proposed, 1800MW coal fired power station at Fawley, not in the British coal fields, is in an excellent position to receive high sulphur open cast coal from Colombia - through Southampton.

The similarities between coal and nuclear power are strong. And when we reach the crossroads it is the so-called "soft energy path", a non-polluting renewable energy strategy, that we must follow.

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Cornish Energy Study

The Cornwall Energy Project is a two year research project set up to devise a local energy policy for Cornwall, based on energy conservation and renewables as far as practicable. CHARMIAN LARKE outlines the Project's development.

Work on the Cornwall Energy Project started in 1983 following the passing of a County Council subcommittee resolution that the potential for Cornwall of energy conservation and renewables should be investigated. It took 3 years to work out the aims and a detailed proposal; and to raise the funds to carry out the work. Most of this was done by summer of 1986 but contractual delays held up the project's start until early 1987. The team is now complete, initial accommodation problems have been almost solved and office systems have been built up over the last 6 months. The County Council are hosting the work and providing some technical assistance to the team of 4 energy people and 2 administrators. There is also a Community Programme team of 11 and some seven sub contractors for specialist advice and assistance. This all makes for complex management and timetabling problems.

The £320,000 funding has been contributed by the European Communities, the Department of Energy, Cornwall County Council, 4 of the 6 local District Councils, the St Austell-based English China Clays International (the local big firm), the Central Electricity Generating Board and Shell Oil.

The main aim of the project is to stimulate action in Cornwall towards a healthier future through improved energy efficiency and local renewable energy production. This of course requires action at many levels, but the first prerequisite is an understanding of the present situation.

This was the first task of the team, and by July this year a reasonable picture of energy supply and demand in Cornwall had been built up. Cornwall's annual energy use is around 40PJ (1.6mtce), costing about £300m. This is about the same as the earnings tourism, one of the major industries in the county. As would be expected in a rural area,

less gas and more coal and electricity are used. (See pie charts)

Anyone who visits Cornwall in the winter and sees the smoking chimneys in every village would assume that a lot of coal is burnt, but what is unexpected is the extent of electricity use for space heating. The pattern of daily demand shows quite clearly that the Cornish curve is the opposite to that of the CEGB daily winter demand curve. Instead of the expected low demand at night rising through the day to a peak around 6pm, in Cornwall the demand rises dramatically after midnight to a peak around 1.30am and drops again once the 'Economy 7' period is over.

The size of this peak indicates that 25-40% of Cornish homes are heated by off-peak storage radiators. The situation is similar in the whole of the South Western Electricity Board's area. It is a reasonable assumption that over 60% of Cornish electricity comes from baseload (ie nuclear) stations. This is ironic as Cornwall has an extremely high proportion of anti-nuclear people!

An important part of the project is to find out, in detail, the potential for each of the renewables. Wherever possible local experts investigate this for the project: Geoffrey Williams of Helston (wind turbine manufacturer) is looking at the wind resource; Rupert Armstrong Evans of Launceston (micro hydro manufacturer) is investigating the hydro potential; Plymouth Polytechnic are modelling the tidal resource. From further afield, the biomass potential is being researched by Reading University.

In Cornwall, it is not generally possible to be more than about 400m from a dwelling, expect on the moors where there are other reason for not installing wind turbines. If it is expected that wind turbines should not offend their neighbours with noise, then using the present generation of large turbines with high tipspeeds the

total resource is nil. However if quiet, low speed machines are used the resource is around 3GW, or six times the present maximum demand for Cornwall. This staggering amount of wind energy could be developed without touching the one third of Cornwall's land area which is designated as being of high landscape value. The difference between the two figures also shows the importance of ensuring that technologies are appropriate, both for their purpose and the situation in which they will be used.

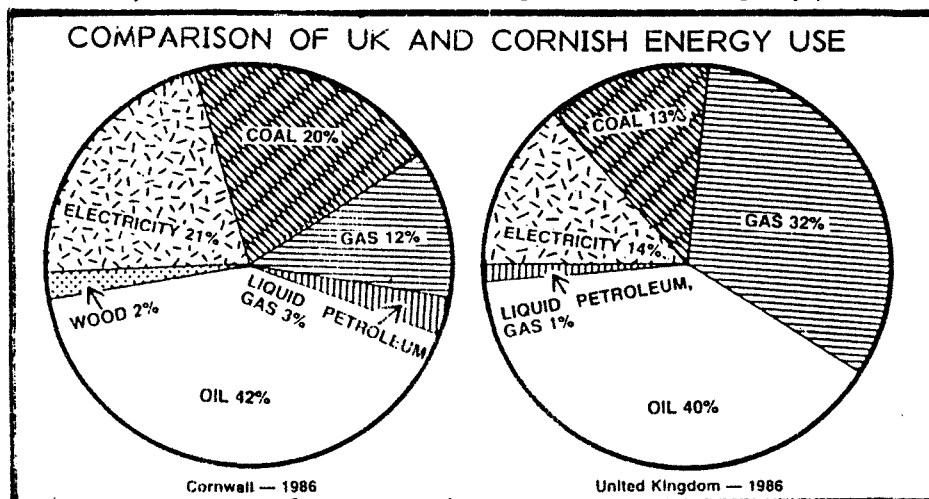
Over the next few months the results from other research on the conservation and renewables potential for Cornwall should become available, which will enable a sensible energy policy for the area to be proposed. This will be the first in the UK, although there is similar work going on in Europe. However, producing a local energy policy is only the first step.

The next step is to begin the process of implementation. It is important to some of the Project's sponsors to achieve action, not just reports. Therefore, preparation for implementation has already begun, with the building of contacts who will either gain from the process (eg firms already manufacturing the appropriate equipment) or who wish to influence the job creation process (eg local politicians). Other important contacts are the fuel supply industries, unions, local and central government, officials and representatives of the many organisations influential in all rural areas: from Age Concern and the Rural Community Council, to farmers, the local Innovation Centre and others.

One way to bring these people together is through the Local Interest Group, which has met once so far and produced a lively and interesting debate, and more work for the Project team!

The organisation and systems to to carry out these numerous, changing tasks effectively are evolving all the time. One example of this is the Community Programme (CP) team. The application for this team was submitted to the Manpower Services Commission in February and the team was appointed in early August. Their task is to input data on the housing stock (for the low energy modelling to be carried out by Earth Resources Research); to collect, input and analyse data on heat demand for Cornish towns and villages as a prelude to work on the potential for combined heat and power/small scale district heating; and to carry out practical and educational projects.

This is but one example of the way the Project is responding to the local environment, as well as stimulating action. Sometimes when we lift our heads above the myriad of technical reports and economic detail required, we begin to see a glimpse of the many interactions needed, and beginning to happen, for Cornwall to move to a low energy future.



Energy Strategy

The Department of Energy (DoE) have launched a "major new campaign to encourage the development of Renewable Energy" in Britain.

The campaign was announced by Michael Spicer, the Government Minister for renewable energy, on a recent visit the Severn estuary. It will involve "publications, exhibitions and videos to encourage the development of renewable energy." He also expressed his anxiety to "... raise the level of awareness of the potential contribution that renewable energy could make in the UK's future energy supplies. I hope our campaign will achieve this end."

The first products of the new campaign have been distributed in the form of a press pack: several fact sheets; a *Renewable Energy in Britain* booklet; and the first issue of *Review* the Department's new quarterly magazine.

The press pack is beautifully produced, but beauty is indeed only skin deep - there is no real message of commitment to renewable energy in any of the enclosed material.

Renewable Energy in Britain is an account of the Department's current renewables programme, stating their perception of the role of renewables in future energy strategies for the UK. This is neatly symbolised in the apportioning of space on the booklet's first page - one third of the text answers the question "What are the Benefits of Renewable Energy?" Whilst two thirds are given over to "What are the Problems of Renewable Energy?" - "the modern world demands energy that is concentrated and readily available. The renewables, by contrast are invariably the opposite."

The booklet does however present some glimmer of hope. The DoE intend to extend the network of international collaboration in the field of renewable energy research and development (R&D); they intend to have passive solar design along with energy efficiency measures incorporated into the building industry by the mid 1990s; and biofuels could contribute to our energy requirements "on a significant scale by the mid 1990s."

Tidal Barrage

The Department of Energy (DoE) are providing £300,000 for four studies into the environmental impact of the proposed Severn barrage. This will take the total expenditure on feasibility studies for the project to £4.2m - jointly met by the DoE, the Severn Tidal Power Group (STPG), and the CEB.

The four studies will examine:

- wading bird migration (to be undertaken by the British Trust for Ornithology) (see SCRAM 61);
- prediction of post-barrage densities of birds (Institute of Terrestrial

There is a useful table on the booklets last page (see opposite), along with a declaration that the incorporation of renewable energies and energy efficient measures go hand in hand - "there is little point in increasing the available range of energy supplies without taking steps to make the best use of it."

Britain has the potential to cut its energy demand by 30%, promoting an annual saving of £8 billion.

It is the DoE's stated policy to "develop technologies that will harness renewable sources in such a way that they help meet the energy needs of the next century, efficiently and economically - and without unacceptable effects on the environment." Laudable sentiments indeed. It seems a pity that Mr Spicer, the Government Minister for renewable energy, can't convince his alter ego Mr Spicer, the Government Minister for nuclear power, to adopt a similar code of practice.

Review, the Department's new quarterly magazine will replace *RE News* previously produced by the Energy Technology Support Unit. It begins, "Renewable energy sources could be making a modest but useful contribution to UK energy supplies from about the year 2000 onwards - that is the view of the Department of Energy." And goes on to explain that success depends not only on the economic circumstance but also on the success of continuing R&D programmes.

Promoting the £100m spent on renewable energies since 1974 (less than the annual sum spent on nuclear R&D), *Review* claims "... by astute allocation of resources and careful selection of priorities the development of renewable energy technologies in the UK has progressed to much the same point as that in other industrialised nations, taking into account the variation in applicability from country to country."






Up until now the DoE's work on renewables has centred on the science and engineering aspects, but in the future more attention is to be given to the questions of environment and public acceptance.

Ecology, Institute of Marine Environmental Research and Ravensrod Consultants;

- passage of fish through turbines (D Solomon, Consultant);
- ecology of sub-estuaries of the Severn (Bristol University);

Michael Spicer, renewable energy minister, announced the studies on the 16 September, during a visit to the proposed site. He also expressed his desire to "inject a note of urgency" and bring the project to a point of decision by the end of next year.

However, the STPG environment manager, Tom Shaw, sees "1992/93 as the earliest date for site work to start," with commissioning in 2000.

| ENERGY | CATEGORY |
|--|-------------------------|
|  Passive Solar Design | Economically Attractive |
| Active Solar Heating | Long Shot |
| Photovoltaics | Long Shot |
|  Combustion of Dry Wastes | Economically Attractive |
| Anaerobic Digestion, eg Landfill Gas | Economically Attractive |
| Thermal Processing of Dry Wastes | Promising but Uncertain |
| Energy Forestry | Promising but Uncertain |
|  Wind Energy - on land | Promising but Uncertain |
| Wind Energy - offshore | Long Shot |
|  Tidal Energy | Promising but Uncertain |
| Inshore Wave Energy | Promising but Uncertain |
| Small-scale Low Head Hydro Power | Promising but Uncertain |
| Large-scale Offshore Wave Energy | Long Shot |
|  Geothermal Hot Dry Rocks | Promising but Uncertain |
| Geothermal Aquifers | Long Shot |

Anyone wishing to receive copies of the above publications should contact: Renewable Energy Enquiries Bureau, ETSU, Building 156, Harwell Laboratory, Oxfordshire, OX11 0RA. Tel: (0235) 432450.

If the project does go ahead the STPG will have to face the problem of raising the £5,500 million capital cost. Previously the Government demanded the project be funded entirely by the private sector but have now dropped this constraint. The STPG now have the "luxury" of considering joint public and private funding.

Paddy Moorehead, STPG project manager, thinks one way of attracting private sector backing is to have the barrage built by an overseas contractor. However, STPG Management Board chairman, Mr Clare, argues "British Industry ... is fully capable of building the Severn barrage project well and economically."

Independent Generators

A new organisation has been formed to "obtain a fair deal for independent electricity producers." The Association of Independent Electricity Producers (AIEP) membership includes industrialists, wind turbine operators, hydro-operators, co-generation plant, micro-chp/mini power station operators and power plant manufacturers.

The AIEP are essentially a lobby group applying pressure on the Government through the media and MP's. The Government recognise their representative role and are expected to invite them to sit on a Government committee reviewing non-domestic rates (see SCRAM 61).

The Association's initial thrust will be an "attack" on the bulk supply tariff (BST) - the price the electricity boards pay independent producers for electricity. There is no regulatory body governing the BST, and the AIEP estimate the boards pay 14% less for electricity than is charged to the distribution boards (the wholesale tariff).

In April this year the CEEB announced structural changes to the wholesale tariff, further widening the gap. The AIEP claim this will make a mockery of the 1983 Energy Act, which was set up to encourage the independent production of electricity. It is because of this and several other worrying trends, such as privatisation, that the AIEP was formed.

They argue, if the CEEB played fair, the independent electricity producing industry would have a more rapid expansion, giving lower prices to the consumer. Modern independent

power generation "close to the point of use is much cheaper and 3 times as efficient as traditional power stations" favoured by the generating boards.

The AIEP have launched a news letter *Independent Power News*. Although the first issue relies on "reports about independent power and privatisation drawn from other publications," it's Editors "intend it to do a great deal more than that in the coming months." However it does provide some interesting insights into the AIEP's strategy.

* Association of Independent Electricity Producers, c/o Orchard Partners, 67-69 southampton Row, London WC1B 4ET. TEL: 01 580 0055

Renewable Energy

EEC Energy Ministers met informally in Copenhagen, during September, to discuss the problems facing the development of renewable energy sources (RES) in the Community.

The Ministers agreed, the main problems facing RES in the community are a labyrinth of red tape causing long process times, high investment costs, lack of technical co-operation, and obstacles to the free movement of equipment across borders.

Over a year ago the EEC estimated that RES could rise from accounting for 1-2% of consumption to 5-6% at the turn of the century.

In an attempt to fulfil this prophecy the ministers agreed to recommend that EEC governments should try in their national legislation, to:

- Simplify administrative procedures and regulations vis-a-vis RES
- Continue research and development programmes
- Establish national inventories of RES which would be circulated at regional and local level
- Promote co-operation between industries producing equipment for RES

Governments will also be asked to examine their legislation to determine whether it is "appropriate for the encouragement and exploitation of these energies."

Deep Gas

The controversial Swedish project, drilling to great depths for gas (SCRAM 58), was brought to an unsuccessful end early in September.

The project's originator, Dr Gold of Cornell University in the US, believes that primordial methane gas trapped under the earth's mantle during the formation of the planet exists in massive volumes deep under Sweden.

Although very small amounts of methane were found in the Swedish bore hole, after reaching a depth of 6.5km the consortium of investors funding the project decided it was unlikely they would find significant quantities of the gas.

Dr Gold, however, believes the drilling has been halted only temporarily, "If other explorations had stopped at the first incomplete attempt, the oil of most modern producing regions would never have been discovered, certainly not that of the North Sea, Alaska or Mexico."

Local Authority Energy Conservation

Scottish local authorities could save at least 10% on their annual £100m energy bill by introducing an energy management programme, according to a report produced by the Commission for Local Authority Accounts in Scotland, "Energy Management in Local Authority Buildings."

The survey involved eight local authorities - five regional councils, two district councils, and one island council. It examined their energy bills for heating, lighting and providing power in non domestic buildings.

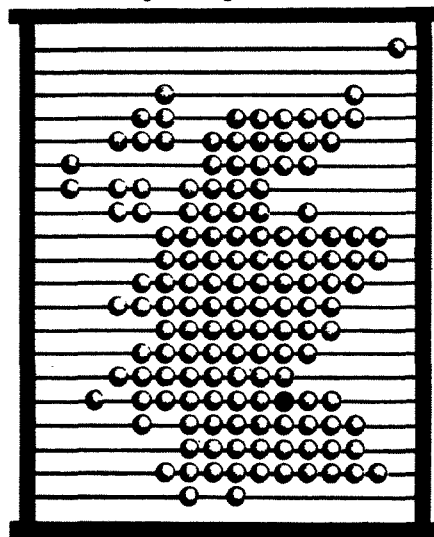
"The full potential for reduction in energy spend will only be realised through an adequate level of investment," says the report.

The Scottish local authorities have a "low level of investment in earmarked energy conservation measures - only 1-5% of annual energy spend." This compares very badly with levels of investment in English and Welsh local authorities, where energy conservation measures account for 10% of the annual "energy spend."

The main reason for this is the English and Welsh authorities are all very similar, but the Scottish authorities are all quite different so no "yardstick" guidelines are available. The report recognises the role of

Government cuts in local authority spending, as the main cause for low spending on energy conservation measures. But, goes on to highlight the local authority spending power as justification for increased investment in energy conservation.

Education, which accounts for 80% of the authorities energy bill "is the main area where the principle thrust for achieving savings should lie." One



local authority estimate there is a back-log of £45m alone - on that basis the Scottish total could be £200m.

Combined with insufficient investment, bad management and "lack of user awareness", are the other major factors to overcome.

The way forward, says the report, will involve both local authorities and government.

- It calls for the Government to:
- relax the financial constraints on local authorities' freedom and resources so they can better tackle the problem;
 - back up their publicity and exhortation to local authorities to conserve energy with a commensurate level of financial support.

- The local authorities must:
- proceed with the necessary maintenance and increase investment on energy conservation measures;
 - target increased investment in the area of greatest potential;
 - set acceptable benchmarks for energy performance and monitor actual performance against target;
 - increase the involvement and awareness of building users and those responsible for plant operation.

Private Power Conflict

A row between Independent Power and the South of Wales Electricity Board (SWEB) is developing into a major embarrassment for the Department of Energy (DoE), in the run up to privatisation of the electricity industry.

Keith Smith, an electrical engineer, wants to use the electricity grid to supply 28 houses and a Hotel in the Welsh village of Miskin but needs the permission of the SWEB. The board contend that they have not refused their permission but "have been unable to connect him because of technical problems with regards to safety."

The problem, which the SWEB told SCRAM has been resolved, is in the way Smith's mini-power station is earthed.

PLANT UNSAFE

The plant's alternator is connected to a static balancer, an artificial neutraliser instead of to earth, allowing it to run independently, in island conditions, when the Board go on fault. The board believe this set-up is unsafe, and are not convinced it would be capable of withstanding a fault condition surge current. Smith,

however, says the station is connected in accordance to the guidelines laid down by the Institute of Engineers (Documents G59, G26 and G46) and that "furthermore they should not be placing their argument with me but with the DoE."

The Board have suggested an alternative solution, but Smith believes their solution would result in surge currents, although only lasting moments, which could damage the stations

SCRAM informed Smith of the Board's statement to SCRAM: "...we checked the generator's electrical equipment and found it differed from the plans originally presented to the Board. Since then we've established that the revised arrangement is acceptable as far as parallel operation is concerned, meaning that subject to satisfactory witness testing the plant can generate electricity and sell any surplus to us." Witnessing involves the Board observing on-line generation from the plant, and if the Board think there are doubts on the plants safety they will disconnect it from "their" grid. The statement provoked considerable amusement from Mr Smith, replying "I wish they'd tell me."

Independent Power are awaiting the Board to put the cut out fuses in, connecting the gen set to the grid, so they can invite the board along for witnessing.

SMITH vs SWEB

The case of Smith vs SWEB poses some serious questions for Cecil Parkinson, the Secretary of State for Energy, concerning the 1983 Energy Act post-privatisation.

Smith comments, "I think the DoE should address this situation and quickly. Mr Parkinson wants to know why there is very little private generation in the UK post the '83 energy act, the answer is simple, he said it himself, there is too much red tape."

Many observers consider the Act to be biased in favour of the Generating and Distribution Boards, who invoke its every nuance to obstruct the independent production and distribution of electricity; and think one of the tasks Mr Parkinson should turn his attention to the setting up of an independent regulatory body to police a revised, fairer, Energy Act.

Acid Rain

The CEBG have announced plans to build the world's largest flue gas desulphurisation plant (Fgd), at each of their three largest coal fired power stations - promoting a 15% annual reduction in Sulphur dioxide emissions.

Drax B, will be the first station to be retro-fitted, using the Limestone-gypsum (L/G) process. The 4000MW plant will require over 700,000 tonnes of limestone and will produce in excess of one million tonnes of gypsum, some of which will be used in landfill.

Drax A will also be retro-fitted with L/G plant. The Board intend the 2 plants to be commissioned in 1993 and 1995, increasing the demand for limestone to one million tonnes and the gypsum by-product to 1.5 million.

Wellman Lord, regenerative process, and is expected to be commissioned in 1997. This process is seen by many environmentalists as much more acceptable - it requires 1/12th of the limestone, and produces sulphur and sulphuric acid - a commercial potential.

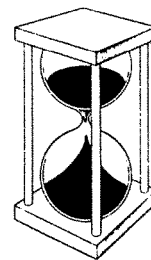
The plants are, however, subject to planning permission, and the Board will submit an environmental statement with their application.

Meanwhile, the Government have once again refused to join the "30% club" - 21 countries have agreed to cut their SO2 emissions to 70% of their 1980 levels by 1993 - which came into force at the beginning of September. A Government spokesman defended their rejection by saying "We do not really believe that it is practicable to cut the emissions in the time schedule required. Being conscientious, we do not want to sign something that we might not be able to meet."

Inner City Energy

An extensive energy conservation programme in the inner cities could create up to 110,000 jobs according to a report, "Regenerating the Inner City: the Energy Dimension," just published by the Association for the Conservation of Energy (ACE).

The "study demonstrates the many practical ways in which an expansion of energy saving activity assists the Government in its declared goals



Association for the Conservation of Energy

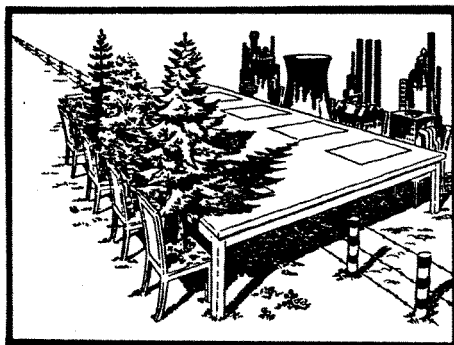
9 Sherlock Mews
London W1M 3RH
Telephone 01-935 1495

regarding our cities", says Andrew Warren, director of ACE.

Britain spends £35bn annually on its fuel bill. Mrs Thatcher, at the launch of Business Week at Milton Keynes Energy World, said "If we could cut that amount of £35bn down - we think by as much as 20% - it would release something like £7bn for purchasing other things. If he (sic) has not to spend on energy costs in his house, the householder has money to spend on other things. That in itself could create more jobs."

The report outlines the compound nature of fuel poverty in the inner cities, inefficient heating combined with poor insulation, and illuminates the groups most affected by this situation the poor, unemployed and elderly, who are the groups in society who spend the highest proportion of their income on fuel.

Although the report clearly and methodically sets out guidelines to help the Government bring their words to life there is one overriding comment, "Why, as we approach the 21st century, are we at the stage where every winter people still quite literally die of the cold."



Piddlers Ferry, is the other station in the programme. It will be the biggest station in the world to use the

Our Common Future, The World Commission on Environment & Development. O.U.P. 400pp, £5.95.
Our Common Future: a Reader's Guide, Don Hinrichsen IIED/Earthscan. 40pp, £1.95

It is now over 15 years since the publication of *The Limits to Growth*, the Club of Rome's report on the predicament of mankind. Its remit was to examine the five factors which, determine the limits to growth on this planet, population, agricultural production, natural resources, industrial production and pollution. And, concluded "only by concentrated attack on all the major problems at once can man achieve the state of equilibrium necessary to his survival."

Our Common Future picks up the story 15 years on. The General Assembly of the United Nations asked Ms Gro Harlem Brundtland to set up an international committee to "re-examine the critical environment and development problems on the planet and to formulate realistic proposals to solve them, and to ensure that human progress will be sustained without bankrupting the resource of future generations." It is interesting to note Ms Brundtland, of Norway, is the only politician to proceed from the position of environment minister to prime minister.

The World Commission on Environment and Development present their report, *Our Common future*, in

a manner accessible to the wide readership it deserves; avoiding the usual jargon which so often renders official reports unreadable.

The chapter on energy sets the debate in a world context rather than concentrating on the so-called energy crisis in the developed world.

Energy Efficiency is of crucial importance to all three worlds. It's cost effectiveness as the most environmentally benign 'source' of energy is well established. "The poor

they are forced to pay more for a unit of delivered energy-services - illustrating the paradox of poverty.

The commission urges nations to direct their energy strategy down the path of energy efficiency, conservation and development of renewable energy sources.

On the question of nuclear power, they recommend "in the strongest terms the construction of an effective international regime covering all dimensions of the problem." And set a list of guide lines for the nuclear industry so stringent they would effectively preclude the nuclear option.

Like its predecessor, *Our Common Future* calls for a united front fighting all aspects of world environmental crisis, but with a greater sense of urgency - born of 15 years more decay.

For those not wishing to attempt the full might of *Our Common Future*, Earthscan and the International Institute for Environment and Development (IIED) have produced a readers guide. It neatly summarises the reports main conclusions, and recommendations: against some extremely beautiful and distressing photographs.

Everyone should buy and read a copy of the report, or a least the readers guide - both are reasonably priced so there's no excuse.

MIKE TOWNSLEY



who light their homes with a wick dipped in a jar of kerosene get one fiftieth of the illumination of a 100W electric bulb, but use just as much energy." Consequently, collectively,

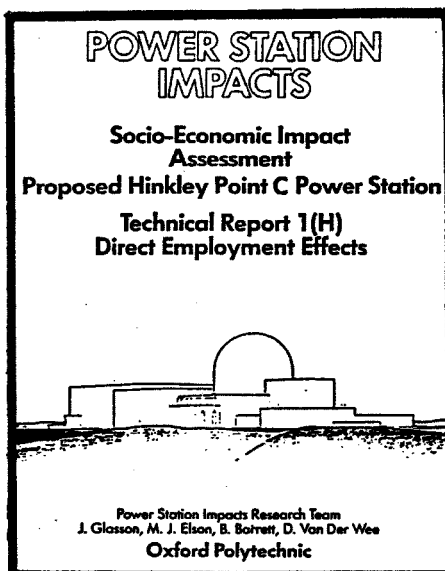
Socio-Economic Impact Assessment: Proposed Hinkley Point C Power Station, Direct Employment Effects. Power Station Impacts Team, Oxford Polytechnic, 1985, 89pp, £10.

The Power Station Impacts Project at Oxford Polytechnic have carried out a number of major studies predicting the socio-economic effects of proposed power stations at Sizewell B, Hinkley C, and Winfrith. Their reports consider effects on direct employment, accommodation, local services, and the wider economy.

The programme was funded by the CEGB, but this does not detract from the wealth of information and statistics collected in the reports. The report on the direct employment effects of Hinkley C, for example, includes valuable information on the population in South West England, unemployment rates, the number of skilled construction workers, and so on.

By using the experience of Torness and Heysham the research team are able to build up an estimated picture of the number of

jobs likely to go to people living within a 'daily commuting zone', should Hinkley C be given approval. Between 42% and 51% of the total



peak workforce of 3500 are likely to be drawn from the local area during the construction phase. They estimate that 43% of the permanent operational

workforce will be recruited locally, but the majority will be in the industrial, administrative and clerical categories.

They also point out that because workers who leave local firms to go to work at Hinkley may not be replaced, the fall in local unemployment may not be as much as expected.

Some interesting differences between Torness and Heysham also emerge. Local recruitment was much higher at Heysham, partly because the area is more densely populated and has a much larger engineering base than the Torness area. But it was also due to different recruitment practices at the two sites. At the time the construction workforce was building up at Torness, the main civil contractor had a number of other projects in Scotland which were coming to an end. It was only after concern was expressed by the local authorities that contractors on the site increased their efforts to recruit locally.

PETE ROCHE

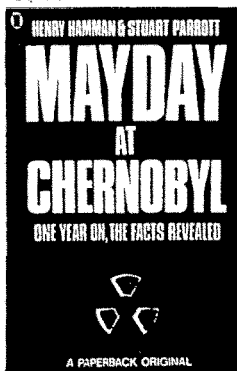
Reviews

Chernobyl & Nuclear Power in the USSR by David Marples. Macmillan. £8.95. 228pp.
Mayday at Chernobyl by Henry Hamman & Stuart Parrott. NEL. £2.95. 278pp.

To fully understand an accident, it is not enough to just examine the event itself. Rather, the whole context and background to the event must be scrutinised and revealed.

The recent publication of two new books, both written by people with a professional knowledge of Soviet affairs is therefore welcome. However, this Soviet bias is not without its drawbacks, particularly in David Marples' book.

Marples' almost exclusive use of Soviet and Eastern block sources, provides a perspective which will be new to most readers. Although these impeccably sourced references encompass the development of Soviet nuclear power and Russia's energy problems, his anti-Soviet stance and lack of nuclear know-how, can only detract from his declared intention not to "make any kind of political comment".



While Marples unequivocally condemns Russia's tardiness in reporting the accident and the inherent instability of their nuclear power programme, he fails to draw any parallel to such western accidents as Windscale and Three Mile Island.

Mayday at Chernobyl has an altogether more populist style, which, incidentally, uses many of the same references as Marples. Where Marples' strength lies in explaining the Soviets' determined commitment to nuclear power, Hamman and Parrott's forte is explaining in simple terms just how the accident happened and the reasons for its dire consequences.

Although Hamman and Parrott share Marples' inability to draw parallels between East and West, they make a vigorous attempt to explain Russia's unwillingness to report any industrial drawbacks. What is really striking about "Mayday" is its analysis of glasnost as an ongoing development, where Marples seems to have wanted openness to come all in one go.

Of the two books, "Mayday" is the one most worth buying. Although Marples' book is also worth reading, I would recommend that you borrow it from the library.

THOM DIBDIN

Nuclear-Free Zones, David Pitt and Gordon Thompson (Eds). Croom Helm. 145pp, £25.
On the Brink, Peter Worsley and Kofi Buenor Hadjor (Eds). Third World Communications. 278pp, £6.95.
Pakistan's Nuclear Development, Ashok Kapur. Croom Helm. 258pp, £30.

There is a lot happening in the local authority nuclear free zone movement around the world. Internationally the movement is coming of age. It's no longer seen as a few left-wing councils making empty gestures, but a practical way in which authorities can join together to fight the nuclear menace. There are a lot of inspiring things happening in other countries where there are different legal systems. In the USA, for example, a nuclear-free county has the legal powers to ban anything from nuclear waste dumping to food irradiation factories.

I was, therefore, extremely disappointed to find out that the first book did not cover 'subnational' nuclear-free zones - but slightly consoled by the vague hope expressed to cover them in a future volume.

What the book does cover is International nuclear-free zones, both those which already have treaties (Tlatelolco, Antarctica, and Rarotonga), and those where treaties have been mooted (Europe, Balkans and Africa).

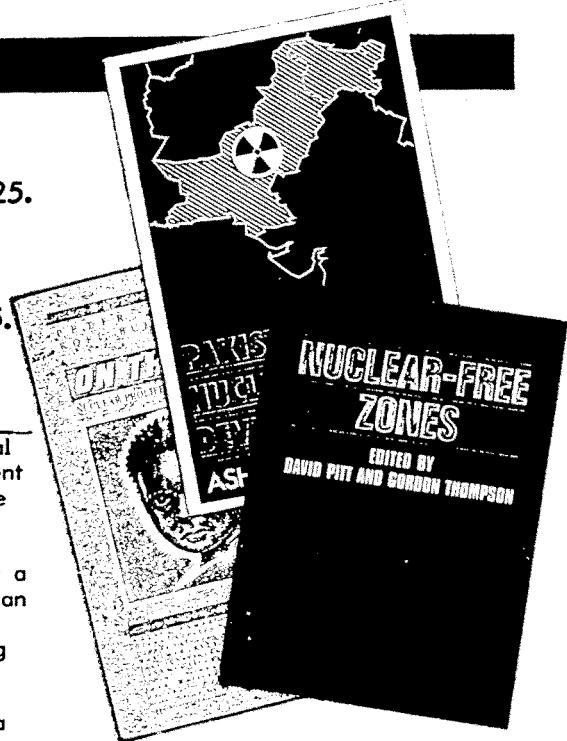
My disappointment in the subject matter, of course, reflected a selfish desire to find useful information to help in the fight against nuclear power in Britain. But when I delved into the book I found much that can be an inspiration to activists worldwide.

The Tlatelolco Treaty in Latin America has been an inspiration for all countries working for world peace. The Rarotonga Treaty, which covers the South Pacific, is far from perfect, with no power to stop US nuclear subs, steaming past the Islands or even visiting ports in Australia, but already it is beginning to have knock-on effects in South-East Asia.

Regional Nuclear Weapons-Free Zones can, at best, supplement universal disarmament efforts - but efforts towards the first have been spurred on by lack of visible progress in the latter. All countries have the right and responsibility to make efforts towards reversing the arms race.

Whilst I found this book interesting and inspirational, I believe the only way for individuals to make any impact on the campaign for a nuclear-free world, is to work from the grassroots level upwards. Let's hope the editors cover the international nuclear-free local authority movement soon.

In contrast to the optimism of the first book 'On the Brink' is a rather depressing read. It lacks a coherent thread running through it, as



each chapter is written by a different author. Nevertheless, it includes some interesting analysis about how and why third world states obtain nuclear weapons. The Rainbow Warrior crops up several times, and there is an interesting theory that New Zealand managed to avoid the destabilisation experienced by would-be nuclear-free governments in Greece and Spain, as a direct result of the Greenpeace boat's demise.

The most important chapters deal with the routes by which South Africa, Israel and India obtained their weapons capability. The rush for nuclear weapons in Brazil and Argentina has somewhat subsided now that they have both returned to democracy. But Argentina is now in a position to export sensitive technologies. Pakistan is now considered to be a near-nuclear weapons state, leading to worries about a South Asian arms race, and fears of a pre-emptive Israeli bombing raid.

The third book 'Pakistan's Nuclear Development' deals exclusively with this last, most disturbing aspect of proliferation in the Third World. The analysis in this book is somewhat flawed. The author concedes the value of nuclear weapons to India and proposes that India and Pakistan should take steps towards good neighbourly dialogue outwith the East/West agenda. Most of the book is about the political motivation for developing nuclear weapons. There is little about how and where the sensitive nuclear technologies were obtained, and nothing about the hazards to the population of the fuel cycle facilities. The author alleges that, although there are cracks in the West's proliferation controls, there is evidence that the West knowingly collaborated anyway.

If I had to choose between the three books, I'd buy 'On the Brink'. It has the most wide-ranging coverage of the issue of horizontal proliferation.

PETE ROCHE

Little Black Rabbit

Little Black Rabbit was wandering around the Torness site recently. Not long after the postie had been, it became obvious that the contents of a recently arrived parcel had been thrown straight into the rubbish bin. LBR went for a snoop around the bins and discovered that somebody had thrown away the documents relating to safety procedures. The SSEB apparently know it all already.

Then at precisely 11 o'clock the alarms sounded, and everybody seemed to be heading for one particular shed. LBR thought it best to join them, in case there had been some kind of accident. Then after standing around for only 10 seconds everyone started to disperse. LBR collared one person and asked what was going on. "Oh this happens every day at 11am, it's just a practice" came the reply. But how can you tell when a real emergency happens? LBR asked. "There won't be a real emergency" came the reply, and anyway it wouldn't happen at 11am." LBR hopes that has set everyone's mind at rest. At least we know the balloon won't go up during elevenses.

After Bob Brooks made his allegations about X-rays of good welds being substituted for welds that were faulty at Hinkley Point B, the manager of the station, Mr Outram, went on TV and said that "anybody can look through our books". Bob Brooks and George Pritchard decided to take up Mr Outram's offer, but were told they would have to wait until after the NII had completed their report.

Frank Cook MP also wrote and asked to view their records, but

received the same reply. Frank being a persistent kind of chap, wrote back and said that he would certainly like to take up the offer and see their records after the NII had completed their research. Mr Outram replied saying that he had mistaken the meaning of his first reply. Frank can only see the records if the NII find a problem with the welds. He can't see their records if the NII give Hinkley a clean bill of health. All TV interviews are true, but some are more true than others.

The Equal Opportunities Act has led to the production of a new, rather unexpected kind of low-level waste being produced at the Sellafield reprocessing plant in Cumbria.

Sellafield has its own sewage works, and the solid wastes produced there are dumped at the low-level dump site at Drigg. BNFL's recent attempts to employ new apprentices of both sexes has led to the appearance in the sewage of a kind of waste more normally associated with the activities of a bedroom rather than a reprocessing plant. LBR understands that the sewage wastes dumped at Drigg now contain an average of 10 condoms per day. LBR is thinking of telling Mary Whitehouse and Victoria Gillick in the hope of gaining some new anti-nuclear recruits.

Because the nuclear industry never admitted that anything like Chernobyl could happen until after

the event, they have had to think up a new word for it. We all know that a "scram" is the term used to describe shutting down a reactor in a hurry. Well now UKAEA engineers have coined the term "positive scram" which means emergency action which has the opposite effect to that intended.

Nuclear engineers prefer to bring the reactor on line after a scram. But after a "positive scram" this can't be done. We at SCRAM are pleased to note that our view of nuclear power has now been accepted by the UKAEA as "positive".

An interesting twist on the EDRP discharges issue. Under Scots Law the Crown Estates Commissioners own the land, ie the sea-bed, below the High Water Mark out to 12 miles, and hence claim sovereignty over the water above it. Fish farmers using sea water, whether they farm fish in cages in the sea or pump the water ashore, are seen as tenants and have to pay a sea water tax.

Shetland Islands Council have urged the Commissioners to object to the EDRP plans because, as landlords, they owe it to their tenants to maintain the quality of services provided, ie pure water. Although they can technically object, the Commissioners have decided to take no action - if the go ahead is given for EDRP they will not frustrate the plans.

Dounreay, of course, also pays the tax because they use sea water for cooling purposes. The exact rate is not known, but it is known that the rate is currently under review.

But there is a way for fish farmers to get their own back. Under the ancient Udal Law (a remnant of the islands' previous ownership by the King of Denmark - they were given as a dowry to Scotland's James III in 1468), the crofters own the sea bed down to the Low Water Mark. They can theoretically charge the Crown Estates Commissioners a rental for storage of their water above the Low Water Mark twice daily.

On 12 November NIREX publish a 'consultative document' which will ask the public to decide how and where nuclear waste should be treated.

One thing is certain: it will not be dumped in the Reskojeage quarry in Cornwall near Camborne. Following local opposition to a NIREX survey in the area, the owner of the mineral rights struck a deal NIREX could continue their survey if they paid £2500 per year, and signed a contract that no waste will ever be dumped there. NIMBYs should move to Camborne!



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