

## Nuclear Power & Radiation Risks

Hinkley Revisited

p7

Safety Shortcomings

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On the Crest of a Wave

p17

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# COMMENT

Happy new year to all our readers. Wasn't last year exciting! Let's hope this year is remembered for sense being driven into skulls!

1986 began and ended with Sellafield. A spate of leaks from the plant, at least one of which resulted in worker exposure and a release of radioactivity to the environment, caused a public outcry, and initiated a safety audit by the Nuclear Installations Inspectorate. Their report, a critique of which is on page 3 of this issue, was published in December.

In between times there were many "minor" incidents, both in this country and abroad. The list reads like a "What's What" of the nuclear industry: Cattenom, Hanford, Hartlepool, Hinkley, Hunterston, La Hague, Sizewell, Superphenix, Trawsfynydd, and more. Public opinion grew more anti-nuclear.

Then came Chernobyl. High levels of radioactivity are still being detected in sheep, thousands of reindeer have been slaughtered, produce from Eastern Europe is still being turned away from docks, children may have received preventable doses of radiation. Yet the Government maintain that there was no cause for alarm.

Another public inquiry, into the EDRP for Dounreay, opened, and closed, and still the Sizewell report is not published. The forces of opposition and proposition were again shown to be totally imbalanced. The Environment Committee's second report of the year gave weight to this view.

The year's first report from the Environment Committee criticised the management of nuclear waste, just one month after the short list of four potential dump sites was announced. The dumpers eventually gained access to the sites, following great opposition from local residents.

We must also look on the bright side. The Labour Party came out against nuclear power; the Alliance urged a pause and opposed Sizewell. The Charter for Energy Efficiency was set up; and a Renewable Energy Bill went through Parliament. Norway launched their wave power plants. The Energy Committee backed CHP; but Peter Walker told the tidal barrage people to try again.

1987 may see a General Election. The main issue will be jobs: energy conservation and a non-nuclear strategy will provide thousands of jobs, and will increase our living standards. Vote for the candidate who supports these, and don't vote for those who back Sizewell, Dounreay, Torness or Sellafield.



# Safety Shortcomings

As an early xmas present, the NII report on Sellafield left everything to be desired: they discovered that some of the remedial work demanded in their 1981 survey is still not complete, decreed that further action should be taken, and yet they allowed operations to continue. JEAN EMERY reviews the report and describes some of its shortcomings.

Somebody once wrote that opinion polls are like bikinis: what they reveal is interesting, but what they leave covered up is fascinating. The same might well be said of the two volume Nuclear Installations Inspectorate (NII) report on British Nuclear Fuel's (BNFL) reprocessing operations at Sellafield.

The report, which was 3 months overdue, reveals that some work called for in the "never again" report of 1981 is still outstanding. That report intimated that prosecutions would be forthcoming if standards did not improve. This time they found 672 accidents, but there is no mention of legal action. The present public image of the nuclear industry may be responsible for this.

## THE NII's REMIT

- \* to look in depth at the safety of important operations;
- \* to carry out an examination, from engineering, services and manpower viewpoints, of the operating procedures and those parts of the plant which have implications for safety;
- \* to pay particular attention to those operations involving access to radioactive streams, plant maintenance and containment of radioactive materials;
- \* to report to the Health & Safety Executive.

Leaving aside the operators as culprits, two other suspects emerge for the parlous state of the site. The first is "old plant": the buildings and equipment previously used and now abandoned. The presence of this material does not deter BNFL from pressing ahead with new plant, and ignoring the essential maintenance of the old.

The other culprit which seems to hamper operations is the lack of knowledge or planning for the wastes accumulating at the site. This point is raised several times.

## NII FAILED IN THEIR DUTY

The heaviest criticism was reserved for the operation of B205, the reprocessing plant itself. It is quite obvious when going round B205 (and I have done so three times) that things are seriously wrong, and the workers

know this. They can be no escaping the fact that the unions are as responsible for safety as the management and, although they may not be the people who have neglected the work, they have seen the neglect and allowed it to continue unchallenged. This report is a major step forward in that the workforce is also criticised when previously they have escaped censure.

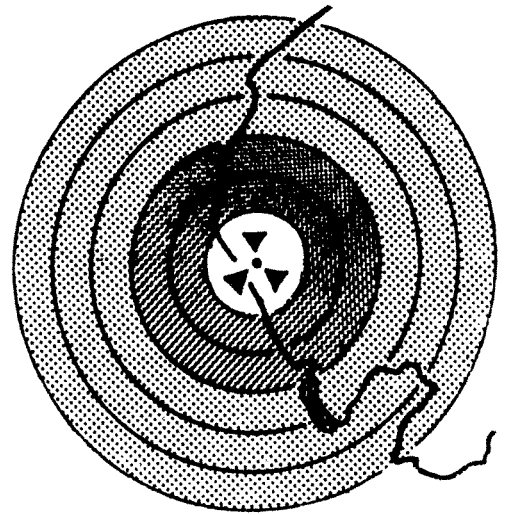
Equally important, the NII have failed in their statutory duty by allowing the plant to operate even though its safety case, the basis for its licence, is still unanswered. The most important aspect of their remit should have been to see that the plant closes until all the necessary work is carried out. It is worth noting that, because the plant was operating most of the time during the audit, the NII could not see all they wanted.

One reason why the NII have allowed this appalling situation to continue is contained in paragraph 7 on the first page of the report: B205 is "irreplaceable" and "must continue to operate" because Magnox fuel corrodes and has to be reprocessed. Yet, evidence from Greenpeace to the House of Commons Environment Committee challenged this untruth, and it has not been answered by the industry. Ergo the need for B205 disappears.

## UNIQUE HAZARD

One outstanding omission in the report, in the year that saw the world's worst nuclear accident, is any reference to four of the world's oldest reactors just across the River Calder. The Calderhall reactors are less well designed and have far less containment structure than Chernobyl. Because of this, and the other activities on the site, Sellafield presents a hazard quite unequalled anywhere else. However, as in most things nuclear, the NII and BNFL did not let common sense and the blindingly obvious stand in their way.

Another criticism of the report is the way it ignored the threat to the pipework, which festoons the plant, from terrorist attack. Some of the pipes carry medium and high level wastes and it is essential that their integrity is maintained at all times. The NII must realise that these pipes could be breached by



the weapons contained in most terrorists' arsenals: an attack by the ANC on the South African Koeberg reactor in 1982 shows that

## THE MAIN CRITICISMS

- \* management is not fully in command of all the processes;
- \* short term planning and piecemeal maintenance has taken place to bring the plant back into operation following annual shutdowns;
- \* low category work is often put off and then carried out when the plant is running;
- \* there is a shortage of radiation monitoring staff despite similar criticisms in the 1981 report;
- \* inspections are carried out on a geographical rather than a process flow basis;
- \* the B205 control room is badly laid out and old fashioned;
- \* operators are undertrained for the tasks they are required to perform;
- \* workers have become complacent.

such an event is not so far fetched.

There is one thing which Sellafield workers and management must remember, as the report states:

"Over 90% of the radioactive waste produced by civil nuclear power generation since it began in this country ... is at the moment on site at Sellafield ... So long as the waste remains in liquid form and therefore dispersible, it presents a hazard to those who work there, and potentially to the public or the environment."

The NII would have been better to advise BNFL to use the £30m, required for the remedial action, on the phased shutdown of the plant, because their failure to act could cost us far more dearly.

## Torness

### MORE DELAYS

The UKAEA are still attempting to find the cause of the control rod vibration problem at Heysham B and Torness, revealed in the last issue of SCRAM.

Although the National Nuclear Corporation (NNC) who designed and built the reactors are responsible for finding the fault, the UKAEA are carrying out tests on their behalf. The damage was first found at Heysham during an unfuelled engineering run of the first reactor. Subsequent tests showed that there is a similar problem at Torness.

The CEBG originally told SCRAM that it would take "a few months to resolve this particular problem." That was in October last year and it is understood that the tests are still not completed. Heysham was supposed to start fuel loading at the end of last year, with Torness following some six months later.

## Magnox

### SAFETY AUDITS DELAYED

The twenty year safety review of the Magnox reactors, some of which are over 25 years old, has been delayed yet again.

The Nuclear Installations Inspectorate (NII), had expected to publish the first reviews in the early spring. It now appears that these have been delayed until next summer because of understaffing and the NII's increased workload.

This must now create some doubt over the Magnox stations, whose operation beyond their twenty year design life is dependent on the electricity boards' justifying their safety to the NII.

## PWR Problems

A recent report from the UKAEA shows that a serious design fault in the PWR remains unresolved.

The problem is one of "fuel-clad ballooning": when the zircaloy casing, which surrounds the PWR fuel, deforms and expands or "balloons" during a loss of coolant accident. This could lead to blockages in the fuel channels, rendering the emergency cooling system useless.

The CEBG have been told by the Nuclear Installations Inspectorate (NII), that ballooning is no longer an impediment to granting a licence, although the report explains that it has not "been shown experimentally what degree of deformation and sub-channel blockage is required to prevent fuel being adequately cooled."

The NII have not, however, granted the PWR full safety clearance, due to several safety questions which remain outstanding. Amongst these are the reactor's coolant pumps, inspection of parts of the primary circuit and the Integrated Protection System, which as yet exists only in prototype.

## TEACHERS VOICE CONCERN

The Midlothian association of the Educational Institute of Scotland (EIS), have unanimously agreed to obtain more information on the precautions necessary "should Torness become operational and an accident occur there."

The decision follows a recent EIS Council vote to state its opposition to the siting of a nuclear reprocessing plant at Dounreay. During the debate, the arrangements for an emergency at Dounreay were described as "inadequate": pupils are to be kept in with the doors and windows closed.

The Midlothian teachers are concerned that, although they are well briefed on what to do if a fire occurs at school, they have no guidelines to follow in the event of an accident at a nuclear reactor. They say this is "clearly unsatisfactory", when they have thousands of pupils in their care.

## Conference

Shetland CADE are sponsoring an international conference to examine the impact of the EDRP development on the environment and economy of the North Sea.

The Conference will be held in Lerwick on Shetland on 4/5 July. CADE hope that it will aid the development of international opposition to EDRP as well as focusing media attention on the campaign. To help organise the conference, CADE are looking for a full time worker to run their office in Lerwick.

Information about both the job and the conference is available from: Shetland CADE, Nibon, Sullom, Shetland, ZE2 9RQ.

## Exorbitant Nukes

Israel has abandoned the idea of purchasing two PWRs from France as "uneconomic".

According to Israeli officials, quoted in *Nucleonics Week*, an economic feasibility study has shown that the two 950Mw units would not be economically viable, even if the French were to agree to a favourable financial arrangement. Israel is not, however, going to abandon plans for nuclear power.

## Roxby Downs

### URANIUM LEAK

Documents leaked from the Roxby Downs uranium mine in Australia show that the management hope to sell uranium to France and Taiwan.

The Australian Government do not currently export uranium to either country because of the French nuclear tests in the Pacific and the fact that Taiwan is not a signatory to the Non Proliferation Treaty.

Further revelations and the documents' significance will appear in the next issue of SCRAM.

## Sizewell

### FOE LOBBY

Following the delivery of the Sizewell report to Mr. Peter Walker, Secretary of State for Energy, Friends of the Earth are organising a lobby of Parliament on Wednesday 4 February.

Although the 3000 page report was delivered in early December, it still has no index, summary or glossary. Until these are produced, Mr. Walker is not legally entitled to make a decision about Sizewell.

In a related initiative, the Druridge Bay Campaign are organising a lobby of north east MP's, since Druridge Bay is one of the proposed PWR sites. DBC, can be contacted on 0670 513513.

SCRAM would urge all those who are concerned about the Sizewell decision and its implications for the future of nuclear power in Britain, to attend the lobby if they can, or if that is impossible, to lobby their MP at his or her local surgery.

### ANOTHER BRICK IN THE WALL

Despite the already vast price tag on Sizewell B, the CEBG have recently admitted that the cost will have to rise by another £8 million.

This unforeseen cost increase will be incurred in building a wall underneath the station. This is to prevent the neighbouring Magnox station from collapsing because of a resultant fall in the water table.

## NIREX

### NEWS APPOINTMENT

The appointment of Ms Angela Rippon to the board of NIREX, has been dismissed as a gimmick, to "improve the image of nuclear waste," according to some members of the anti-dumping lobby. Ms. Rippon however, has said that she hopes to "reflect the anxieties and opinions of the general public".

## Springfields

The fortieth anniversary of the Springfields fuel fabrication plant at Salwick near Preston was celebrated with a joint CND and CANUC (Campaign Against Namibian Uranium Contract) demonstration on 14 November.

One of the action's highlights was an address by Pete Manning of SWAPO. Describing the links between illegally mined Namibian uranium and British nuclear power, he spoke of the appalling conditions at the Rossing Uranium mine. Working conditions are substandard and workers routinely swallow uranium dust.

Because of the state of emergency in Namibia, Rossing is in a virtual police zone. Any attempts by workers at the mine to improve conditions are repressed by the notorious koeroet, or "crow bar" special police unit.

## More Magnox Decay

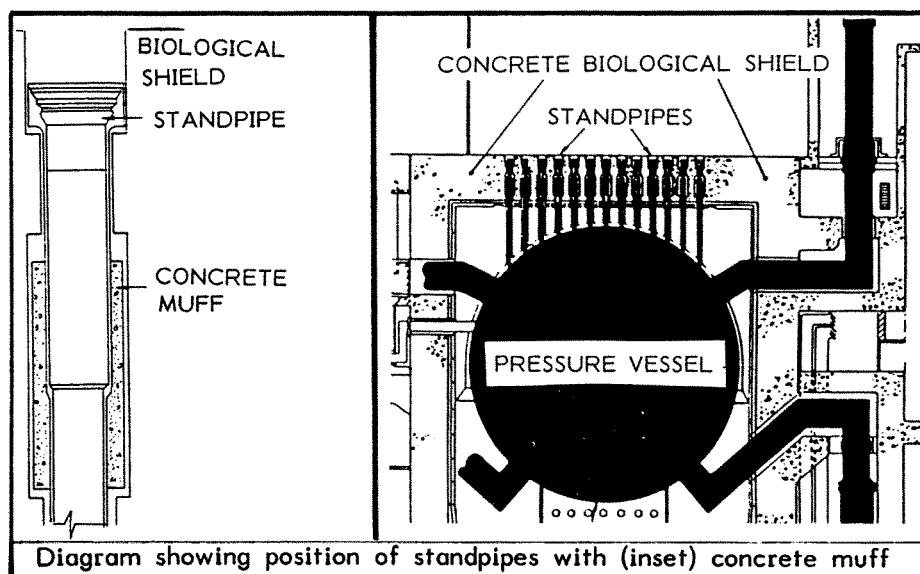
The CEGB have revealed that a corrosion problem of a type hitherto thought impossible has been found in the number one and possibly number two reactors of the Hinkley Point Magnox station in Somerset.

Although the CEGB have known about the problem since 1983, it was not acknowledged until December 1985, at a private meeting with Mr. Paddy Ashdown MP. It is now the subject of investigation by the Commons Energy Committee.

The problem is located in the bioshield area, between the reactor and the pilecap in the reactor hall. The bioshield is penetrated by standpipes, which allow the insertion of fuel stringers and control rods. Surrounding these are concrete "muffs", which block the radiation shine path up to the pilecap (see diagram). Three of the standpipes in the number one reactor and possibly a fourth in number two, have had to be sealed off, because of a build up of rust where the muff is in contact with the pipes' steel lining. This has forced the lining to bulge inwards and inhibit the passage of the fuel charging sleeve, which contains the fuel assemblies.

In March 1986, the Nuclear Installations Inspectorate (NII) informed the CEGB that the reactor could only continue operating if a series of conditions were met. These included the continued monitoring of all the standpipes in the reactor, the investigation of the possibility of improving the CO<sub>2</sub> monitoring in the area of the standpipes and the development of equipment to remove the pipes.

According to the NII, the first two of these requirements have already been met; a method of replacing the standpipes is still being investigated. The CEGB estimate that this will cost over a million pounds. This figure is only for development of equipment



and does not account for generating losses, which other sources estimate would make the total cost in excess of five million pounds. It is worth noting that the engineers at the Windscale AGR are just beginning to address the problem of removing the standpipes during its decommissioning.

The CEGB have consistently claimed that the problem is caused by chlorides. They originally told Mr. Ashdown that they thought Hinkley's seaside location was to blame. But the station manager, Mr. John Outram, has subsequently stated that "the probability is that somebody urinated in the pipe" when the station was built, some twenty years ago.

This theory has been rejected by consulting engineer, Mr John Large, who has been present at meetings between Mr. Ashdown, the CEGB and the NII, and is presenting evidence to the Energy Committee. He told SCRAM that the depth of corrosion below the top of the muff would mean that the person relieving themselves would have had to be both

very accurate and incredibly thirsty to have caused the problem - if urine is the problem then "this is surely the original nuclear leak." He said that the problem could be consistent with both carbonation of the concrete, which is a well understood process, and chloridisation due to the salty air which passes over the standpipe and muff cap to cool them.

The CEGB evidence to the Energy Committee does not mention the possibility that urine caused the problem. It does, however contain some glaring omissions:

- \* the cause of the problem is not known;
- \* no chemical analysis to find the cause has been initiated;
- \* it is not known how many pipes are affected;
- \* the extent of the problem in similar reactors is not known; and
- \* the number of affected pipes needed to initiate a reactor shutdown is not known.

The Energy Committee's inquiries continue.

## BNFL

### BNFL (CUMBRIA) LTD?

Plans by British Nuclear Fuels to set up a development agency in west Cumbria have come to light following the leak of a confidential County Council report.

The report, which Cumbrians Opposed to a Radioactive Environment (CORE) have called a "highly political attempt to 'sell' Cumbria's future job prospects", identifies the potential loss of jobs in the area if either the Barrow dock yard or Sellafield "cease operation or change its product."

To remedy this situation, the report by the Council's director of economic development, Mr. John

Burnett, supports proposals "agreed in principle by the board at BNF" to set up a "development company for west Cumbria."

Under the proposals, BNFL would fund the project for ten years with full voting rights, and a casting vote "in the event of an equality of votes in the company." CORE point out that this would give BNFL a "virtual stranglehold" over the local economy. The project would be managed by BNFL, the County Council, and the two local Borough Councils. Industrial land would be transferred "free of debt" (ie. given) by the Councils to the company.

One of the major reasons for accepting the BNFL proposals, given in the report, is the loss of jobs that will ensue when THORP is completed,

a point which was strenuously denied by BNFL during the Windscale Inquiry. CORE claim that investment in waste storage, as opposed to reprocessing, would create more jobs in the semi-skilled and unskilled labour markets which will suffer most when THORP is completed.

Mr. Burnett concludes in the report that "the proposal represents a unique opportunity for the County Council to support the economy of west Cumbria at little cost to itself," but as one County councillor pointed out to SCRAM: "it isn't BNFL money, it's taxpayers' money."

The report was presented to the full Council on 19 November, when it was referred back to the economy and environment committee for more information.

## Greenpeace

Greenpeace anti-nuclear activist, Mr. George Pritchard, denied media reports that following a fact finding visit to BNFL sites, he was "impressed" by the way Sellafield is run.

The visits in early November, followed an invitation by the Unions to tour Springfields, Capenhurst and Sellafield. During an evening in the pub with the union reps, Mr. Pritchard was approached by the local media for a radio interview. Although it had been agreed that the visit would not be used for publicity, consent to the interview was given and six minutes recorded.

Mr. Pritchard was asked what he thought the future for Sellafield to be. He stated that as Greenpeace would "never, ever" consent to the pipeline out to sea or to emissions from the chimneys, there "is no future for reprocessing at Sellafield." However, when the nuclear industry is closed down, the centre for waste management has to be somewhere: that is the future for Sellafield.

When asked to compare Sellafield with the chemical industry, Mr. Pritchard replied that he was impressed by what he had seen at BNFL's plants, in relation to what they are trying to do to clean up their image, and repeated that there "is a future for Sellafield."

Mr. Pritchard told SCRAM that

the interview was cut, so that it was this last answer which was broadcast, out of context without clarification. The broadcast was picked up by a news agency and published by the Nationals without checking the facts.

### MUF AT SELLAFIELD

● Four kilos of plutonium and 15 tonnes of depleted uranium have been "gained" at Sellafield over the last financial year, but 400 grammes of highly enriched uranium is missing.

The figures for Materials Unaccounted For, or "MUF", are a constant embarrassment to the nuclear industry, who claim that they are purely a "bookkeeping exercise", and that "in all probability, nothing was gained or lost".

## Accidents Will Happen...

### WANDERING WASTE

● Four tons of used control-rod blades went missing on the tracks of the American Railway system in early December. The waste went AWOL whilst on the way to the Washington state waste dump, but ended up half a continent away in the small town of Willmar in Minnesota.

### HINKLEY BREAKDOWN

● The jinxed AGR at Hinkley Point in Somerset (at least 10 "incidents" in the last 15 months) has suffered two recent shut downs.

The number four reactor has been operating at reduced power and was eventually shut down, because of overheating in the fuel elements. Carbon had built up on some of the elements, because of "chemical reactions in the carbon dioxide coolant gas," according to the CEBG.

In a separate incident, both of the reactors were shut down for a week when a blocked valve in the turbine hall affected control of the boiler feed water system. The CEBG said that the blockage was caused by a piece of dirt, although television pictures showed the saucer sized valve to be rusted solid.

### CATTENOM LEAK

● The leak last August, at the Cattenom nuclear complex on the Moselle in France, (see SCRAM 55), was far more serious than initially thought.

According to Electricite de France (EdF), 130 thousand cubic metres, not 8000 litres, of water spilled into the reactor's basement on 23 August. The pumps which should have kept the basement dry had a maximum capacity of 1.5 cubic metres per second, while the leak reached a rate of 2 cubic metres a second. Although the pumps were clearly audible, the leak went undiscovered for four days, during which time cables belonging to the reactor's safety systems were slightly damaged.

### TWO DIE AT SURRY (USA)

● Two workers at the Surry nuclear plant in southern Virginia were killed in an accident on 9 December.

The accident occurred when a pipe burst, spraying the workers with superheated water and steam. Eight people were injured, and two people died later in hospital. The plant's two PWR reactors automatically shut down.

In a similar accident in 1983, one person was killed and another injured, according to a report in the Scotsman.

### HANFORD HITCH

● The 'N' reactor at the Hanford nuclear complex in America has been shut down for safety modifications. The plutonium producing reactor is reported to be the only US plant of a similar design to Chernobyl.

The announcement follows a difference of opinion in an expert panel, formed to examine the reactor's future. Two of the six panel members wanted the plant to be permanently closed, unless its plutonium is needed for national security, but the others agreed to a six month shutdown to allow the \$50 million modifications to take place.

One of the major recommendations made by panel was that the reactor be permanently shut down within five years.

### CONCRETE CANCER

● Cracks have been discovered in the Maentwrog dam, which holds back the cooling water for the Trawsfynydd nuclear reactors in North Wales.

The cracking, caused by a process known as "concrete cancer", was found when water was seen trickling through the 90 foot high dam. It has led to nearly a third of the lake's 33 million cubic metres of water being syphoned off, "as a precautionary measure." The CEBG claim that this will not affect the working of the power station, which uses about 34 million gallons of water every hour.

### CHINON STARTUP DELAYED

● The start up date for the Chinon A3 reactor in the French region of Indre-et-Loire has been delayed, due to robot problems.

The reactor, used to produce weapons-grade plutonium as well as electricity for the grid, was shut down in 1984 for replacement of severely corroded support structures. These repairs, expected to increase the reactor's life by 10 years, were due to be completed this winter. Problems with the specially designed "ISIS" robots, mean that this has not happened.

### DUTCH NUKE DEFECTIVE

● Serious flaws in the emergency procedures at the Borselle nuclear plant in Holland have been found by an International Atomic Energy Agency inspection, according to the Dutch magazine *Vrij Nederland*.

The IAEA found that the 450MW PWR has problems with ventilation and emergency power supply. Staff shortages and the lack of plans, in case of an accident, were also criticised.

### SIZEWELL SHUT

● The Sizewell A Magnox reactor was shut down during November, because of a worn clutch in a gas circulator.

### DUNGENESS & WYLVA LEAK

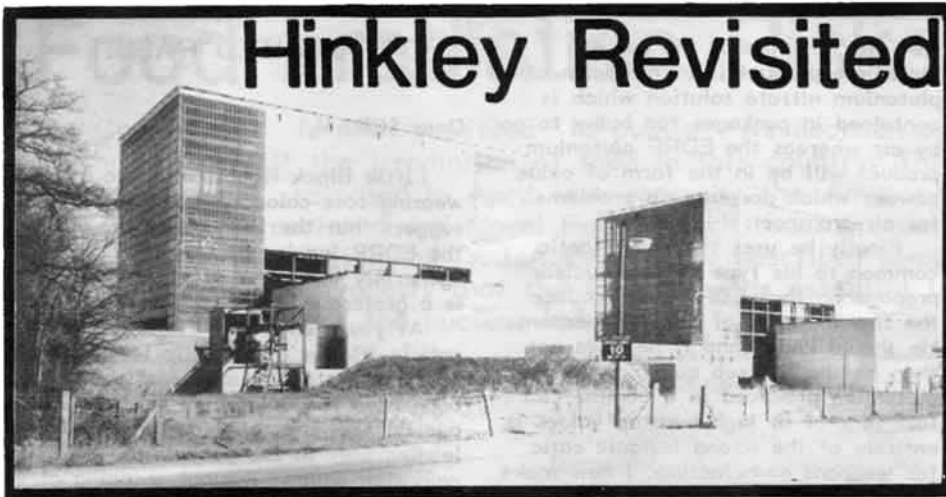
● The Magnox power station at Wylfa in Anglesey leaked 30,000 gallons of radioactive effluent into the Irish sea in late August.

Mr Dick Spring, Eire's deputy Prime Minister and Energy Minister, was furious that the Irish government was not informed of the leak and only found out about it through the media.

● About four tonnes of carbon dioxide coolant gas was released from one of the Dungeness 'B' Advanced Gas cooled Reactors in early November. It was not stated whether any radiation was involved.



# Hinkley Revisited



Since our major article on Hinkley Point in SCRAM 46 there have been several alarming developments in the locality: site accidents and also child leukaemias and cancer cases. With three of the Hinkley reactors presently closed down BRIAN JENNINGS gives an update on the current position.

The accident receiving national notoriety happened on 6 September 1984 when for 13 minutes (or was it longer) Hinkley A was on the way to meltdown. I understand that questions have been asked in Parliament so answers to this particular incident should be forthcoming.

In November '85 the infamous Hinkley B accident, involving the release of 8 tonnes of radioactive gas, required the issuing of potassium iodate tablets to 500 workers, for the first time in Britain.

## "SLACK MAINTENANCE"

What the public is not aware of is the serious situation concerning maintenance work on both Hinkleys. Both cases bore the elements of slack maintenance.

The Magnox "incident" was marred by a back-up generator being left unrepaired for a week. The AGR fiasco involved maintenance, or the lack of it, stretching back years. A badly fitting bolt went undetected since initial fitting; it was forced out under pressure when four nuts were being loosened by two operators. Apparently this could not have happened if an internal collar, thought to be part of the original design, had been included in the initial installation.

Questions come to mind as to whether this collar was deleted as a cost cutting exercise. But the extraordinary decision not to immediately modify the 15 other gas circulators, but to do so only "as maintenance opportunities allow", should be a frightener to us all. Are government cut backs affecting the very safety of nuclear power stations? It's either that or the station manager needs

to increase his maintenance staff before a disaster befalls not only locals but the national population.

Staff difficulties reached a peak at the end of August 1986 when maintenance staff walked out because equipment was sent offsite for repair and inspection.

At the time of writing three of the four Hinkley reactors are shut down. It appears, after limping along for several weeks at reduced capacity, Hinkley B was finally brought to a halt. This shutdown was caused by a blocked valve in the turbine hall, affecting the boiler feedwater system. This valve, a little larger than a saucer, was shown on television to be rusted solid, unable to move.

Hinkley A's reactor was closed, so it was claimed, because a worker answered "the call of nature" 25 years ago: CEBG officials believe corrosion problems now blighting the station could have been caused by a construction worker relieving himself. Spending a penny could cost them over £1 million! The most expensive "leak" in history, they say, has caused two stainless steel standpipes to corrode in the number 1 reactor pile cap.

## POCKETS OF LEUKAEMIA

Letters I have received indicate surprise that our local authority is not taking Woodspring's childhood leukaemia and cancer cases seriously. Woodspring District's southern boundary is only 10 miles from Hinkley Point, and the station can be clearly seen from Weston's sea-front hotels.

Pockets of leukaemia have been detected throughout Woodspring in the past 15 years: at Bournville, Worle, Yatton, Nailsea and Blagdon. The Bournville cases include 3

leukaemias in 2 years, practically in the same road. Blagdon cases include 2 leukaemias, a Hodgkins disease and 2 cancers, of which one has died, among a population of 1200. This village is situated beside a lake, which is part of Bristol's water supply, and is renowned for its trout-fishing.

The only protection offered the inhabitants is a geiger counter used twice annually in five separate locations along a seven mile stretch of shore line in Weston-super-Mare.

After Chernobyl, activity perked up a little: as well as the five shore line monitoring tests, two rain water samples were analysed to compare with tap and distilled water. Monitoring was undertaken on 9 May; apparently the highest airborne deposition from the cloud passed over this area between 2 and 4 May. Rain fell in Bristol and several areas of Woodspring during this weekend.

It is doubtful whether locals would have been informed if tests had been done during highest concentrations, as the counter seems reluctant to rise above "less than 1 count per second."

## INDEPENDENT MONITORING

It was suggested a few months back that Woodspring should buy a dosimeter, a more sophisticated machine to monitor radiation, at a cost of £700. A subsequent couple of noughts were added as the costs of operation. So, unfortunately 170,000 residents will be denied independent environment checks for a theoretical £60,300 worth of manual costs and analysis.

Thank goodness the County of Avon has different priorities. Under their initiative, an idea from a member of the public is bringing five counties bordering Severnside together on a joint monitoring scheme. Let's hope other authorities not content with the nuclear industry's own figures will be alerted to this scheme. Avon, to its credit, is also supporting Somerset in its fight against the PWR proposed for Hinkley C.

Four nuclear power stations are sited along the Severn Estuary, (each with two reactors), the others being Oldbury and Berkeley. Amersham International is also discharging tritium from its Cardiff factory. Years of possible independent research into the effects of low level radiation have been wasted. Berkeley has been operating for 26 years and Hinkley A for 21 years. Not even thyroid gland analysis has been thought advisable, when each reactor is discharging iodine-131 routinely, year in year out; decades of possible harm. Of course if no records are kept, they can never be checked.

## PLUTONIUM PROPAGANDA

Dear SCRAM,

The article "Secret Transport" by Peter Mutton (SCRAM 53) contains so many inaccuracies and untruths that it is difficult to know where to start in penning a reply. However I shall do my best to be as brief as possible.

In the preamble Mr. Mutton states, in connection with the EDRP public inquiry, "a significant issue which will not be dealt with is the transport of plutonium." Mr. Mutton must surely be aware that the joint UKAEA/BNFL Precognition D/P/16 has been submitted to the inquiry. It is titled "The Transport of Plutonium and Uranium from EDRP" and was in fact presented to the inquiry by Mr. P. W. Wilson on Wednesday 30 April. Not a very good start to inspire any confidence in the rest of the article.

Mr. Mutton goes on to state that the Environmental Impact Assessment makes no reference to studies carried out to demonstrate the ability of the container to withstand aviation accidents. The EIA makes no pretence at being a comprehensive document which is why additional information such as precognitions and productions have been prepared for the inquiry. Precognition D/P/16 does in fact cover container testing and at the end of the proceedings on 30 April a video film was presented in which a container was dropped from 5000ft onto concrete. The container itself suffered some damage but the contents of simulated plutonium oxide powder in steel cans remained intact.

Peter Mutton asks why plutonium currently being produced at Dounreay goes by sea and not by air. This is a typical example of omissive reporting.

He fails to say that the present plutonium product is in the form of plutonium nitrate solution which is contained in packages too bulky to go by air whereas the EDRP plutonium product will be in the form of oxide powder which presents no problems for air transport.

Finally he uses the same tactic common to his type of anti-nuclear propaganda that EDRP will produce the raw material of nuclear weapons. He should know (and if he does not then he should keep quiet) that plutonium produced in a commercial fast reactor at high burn-up values is entirely of the wrong isotopic ratio for weapons manufacture. I now make the score: Nuclear Industry 4, Mr. Mutton 0 in respect of his article.

I have met some opponents of nuclear energy and have had reasoned and intelligent debates with them. I can understand their concern and I respect their views. It is pseudo journalism of the type produced by Mr. Mutton which demonstrates that he is prepared to utter any statement however distorted or untrue in furtherance of his dubious aims.

I would hope that the readers of your Journal will not be taken in by such soap box outpourings. They deserve and should demand more objective reporting that will appeal to their intelligence.

Yours faithfully,

B. Durrans  
(Chair, Dounreay Staff side)

*Shortage of space prevented the publication of this letter in earlier issues. We hope Mr. Durrans didn't think we were ignoring his side of the argument. We also hope that Mr. Mutton will continue the discussion.*

## SHORT-SIGHTED RABBIT

Dear SCRAM,

Little Black Rabbit must be wearing rose-coloured spectacles. To suggest that the SNP's evidence at the EDRP inquiry at Dounreay was "generally in favour of nuclear power" is a grotesque distortion of the truth.

As you mention yourself in the article "Power Politics" (p.16) the SNP has a long-standing and consistent opposition to nuclear power and nuclear weapons. SNP activists took a leading part in the successful campaign against nuclear dumping at Mullwharchar in Galloway. We have totally opposed Torness and have long warned of the threat to the Scottish mining industry.

We have consistently opposed nuclear expansion of any kind in Scotland. At our last National Conference we voted to decommission all nuclear power plants in Scotland. We also have a radical and comprehensive energy policy for Scotland which strongly advocates the non-nuclear alternatives such as a massive programme of energy conservation, combined heat and power and the development of the wide range of renewable energy sources with which Scotland is so well endowed.

At the Dounreay inquiry we presented what many people considered a full and well researched case against EDRP. We did accept that we have a moral obligation to deal with the nuclear waste which has been generated in Scotland. To do otherwise would be to imply that it should be buried in somebody else's backyard. We also accepted, therefore, that there is a need to find solutions to these problems which have been imposed on us by successive British governments. However our clear and unequivocal conclusion was that EDRP should be totally rejected.

To interpret this as "generally in favour of nuclear power" is to indulge in the sort of disinformation which we all deplore when it comes from the nuclear industry.

I suggest that if Little Black Rabbit, who is obviously a mischievous creature and who also appears to fly a flag for the British Labour Party, really wants to be mischievous she should turn her beady eyes on the nuclear statements and actions of Neil Kinnock MP, John Cunningham MP, Alex Eadie MP and the recently adopted Labour candidate for Caithness & Sutherland.

Yours in hope,  
Kerr MacGregor  
(Energy spokesperson, SNP)

## PUBLICITY UPSETS SSEB

Dear SCRAM,

On the night of 6 October a train carrying nuclear waste from Hunterston to Windscale was in collision with a wagon loaded with aviation spirit at the St Quivox junction just one mile north east of Ayr.

Emergency services were summoned for the practice, for that is what it was, which began at 8am on 7 October and lasted until about 12 noon. Needless to say everything was carried out successfully, no one was hurt and the public of Ayr was not unduly disturbed - or so the SSEB would have wished.

A number of moles in the region, however, leaked, not nuclear waste, but the information, to local CND and to the Ayrshire Radiation Monitoring Group and the message was passed to West Sound Radio, Scottish Television, and several newspapers, both local and

national.

To the surprise and, it is suspected, the annoyance of the SSEB, the exercise was given publicity and this, in spite of protestations to the contrary, is not what the various electricity boards really want. After all, if one is going to rehearse measures to be taken in the event of an accident, there must be a possibility of such an accident.

Is nuclear power worth having or is the need for nuclear power a disguise covering the production of weapons grade plutonium? Could this be the reason why the Government is not privatising the electricity production industry? Or is it that the true cost of the nuclear power stations is so high that private companies could not afford to run them?

I hope moles of the world will unite and keep us informed of all these secret exercises.

Yours sincerely,  
Ken Conway.

SCRAM welcomes any correspondence. Please feel free to write, and we'll try to print all letters: keep them to about 300 words, if possible.



# Food Irradiation Risks

The Government is soon expected to publish its decision on whether to permit the irradiation of food in this country. This follows a report released in April last year by the Advisory Committee on Irradiated and Novel Foods which recommended to go ahead. This article by D. RAJEANDRAN describes some of the hazards and suggests that the technology is essential to ensure the survival of the nuclear industry.

Irradiation is performed by passing the food along a conveyor belt under a source containing cobalt-60 or caesium-137, actually waste products of the nuclear power and weapons industries, and bombarding it with gamma rays to kill germs and slow its natural spoiling rate. In this way it is claimed that the shelf-life of the foods can be extended.

The technique is being presented to consumers as a safe alternative to harmful chemical preservatives. Its proponents are promoting the idea in many Third World countries, including Malaysia. Food irradiation is being strongly opposed in many industrial countries and it is banned in Britain.

Promoters of food irradiation include the International Atomic Energy Agency, the World Health Organisation, the Food and Agricultural Organisation and several industrial countries. But, is the process clean and safe?

The level of radiation used is between 5000 and 4 million rads. A worker in the nuclear industry is allowed a maximum dose of 1 rem a year (approximately the same as 1 rad for gamma rays). The food exposed to the radiation does not become radioactive, but its molecular structure can be changed and the DNA (genetic material) can be damaged.

## HAZARDS DISCOVERED

Many studies on the safety and effectiveness of food irradiation have been carried out and the following are some of the problems noted:

- \* children and animals fed with newly-irradiated wheat have exhibited "polyploidy", a genetic abnormality where cells contain more than the normal one set of chromosomes;
- \* rodents fed with irradiated onions tend to have significantly smaller testes or ovaries than those of control animals;
- \* aflatoxins naturally produced by fungi in some foods were found to be more abundant in irradiated foods than those not treated. They are carcinogenic compounds 1000 times more potent than the banned pesticide ethylene dibromide (EDB) for

which irradiation has been substituted;

- \* "radiolytic products", such as formaldehyde and peroxide, are produced by irradiation. The US Food and Drug Administration (FDA) stated in a 1980 report that 100 krad may produce "enough radiolytic products to warrant toxicological evaluation";
- \* vitamins A, C, E and especially B, as well as amino acids and fats, may be destroyed by irradiation;
- \* the use of more than one type of preservation method, eg. irradiation followed by canning, may result in the nutritional quality of the food being seriously affected;
- \* bacteria and viruses can develop resistance to radiation, and dangerous mutations and new strains can be produced.

The doubtful nature of irradiation as a food preservation measure can be seen from the above points.



Irradiation technology for food preservation is only a disguise. Nuclear waste is building up at an alarming rate, hence the urgency of selling the technology to the Third World; it is essential to the survival of the nuclear industry.

In a speech to the New York Society of Securities Analysts, Dr. Martin Welt, Chairman of the Board of Radiation Technology US said:

"Consider for a moment the advantages of irradiation for the



Third World Nations lacking adequate distribution networks of refrigeration systems. Remember one billion Chinese as a large potential market where household refrigeration is non-existent."

Irradiated potatoes, garlic, onions, peanuts, rice, mushrooms and sausage are already on the Chinese market.

## BIASED STUDIES

"Scientific" studies carried out for the promoters of the technology have been proved to be biased towards the industry. Studies by Industrial Biotech Laboratories (IBT) in the US are one example.

The General Accounting Office in the US has reported that IBT studies, funded by the US Army and the International Facility for Irradiation Technology among others, have numerous deficiencies. These include missing records, unallowable departures from contracts, testing protocol, poor quality of work and incomplete disclosure of information on the progress of the studies.

US consumers are already eating unlabelled irradiated food. The US FDA have approved doses up to 1 million rads to control bacteria in spices and seasonings, which are sold without explanatory labels.

Dr. Geraldine Deltman, Radiation Safety and Biosafety Officer at US Brown University, has said that:

"radiation is a carcinogen, mutagen and teratogen. At doses of 100,000 rads to fruit and vegetables, the cells ... will be killed and most insect larvae will be destroyed but fungi, bacteria and viruses ... will not be killed or inactivated at these doses. They will be mutated, possibly leading to more virulent contaminants."

In Malaysia, food irradiation promotion exercises were begun in April 1985, through workshops organised by the Nuclear Energy Unit of the Prime Minister's Department. In a paper presented by two scientists of the Asian Food Handling Bureau, it was said that it meets the consumer desire of having fresh food in their original form. What is missing from all this propaganda on food irradiation are the hazards and uncertainties involved in the process!

# End of the EDRP Road

With its conclusion on 19 November, the public inquiry into the European Demonstration Reprocessing Plant (EDRP) at Dounreay became the longest in Scottish history. Many issues remained unaired and it is doubtful whether the applicants have provided sufficient information to prove the case. STEVE MARTIN looks at the issues raised.

Although not as long as the marathon Sizewell inquiry, the inquiry into plans to build a reprocessing plant at Dounreay to serve a future European programme of fast reactors lasted 95 days, just 5 days short of the 1977 Windscale inquiry which examined British Nuclear Fuel's (BNFL) application

- \* many important issues were ruled out of the inquiry; and
- \* the venue, Thurso in the north of Scotland, was too isolated for many objectors to attend on a regular basis.

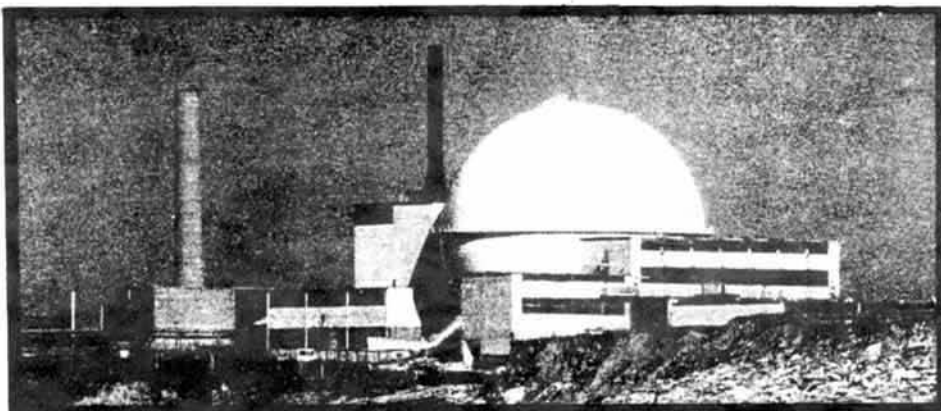
All of these arguments have been vindicated.

Those objectors who did take

outline planning permission. In the fullness of time, after permission has been granted, the details will be worked out with the regulatory bodies.

This indicates particularly well the inadequacies of the local public inquiry system, and provides a strong argument in favour of a change in the system, a view the Environment Committee came to in their report on the subject which was published during the inquiry's summer recess. Indeed, even the Government is suggesting a change, but their idea is to speed up the process, not necessarily to make it more democratic.

There is another stage of inquiry which the applicants have to endure before EDRP can be built at Dounreay: discussion with their European partners. It became apparent during the inquiry that the French are keen to build EDRP and, as such, the UKAEA and BNFL (and the Government) are anxious to obtain planning permission as soon as possible to hopefully thwart the French initiative.



to build THORP (Thermal Oxide Reprocessing Plant). Last year the House of Commons Environment Committee were critical of THORP and recommended a full economic review before it continued, despite £300m having already been spent. Is it possible that the same fate may befall EDRP?

## UNFAIR INQUIRY SYSTEM

The EDRP inquiry began in April after a long debate whether it was the proper forum to consider such an application. It was felt that a development as complex as this should have been the subject of a full Planning Inquiry Commission (PIC), a vehicle that exists in Statute but has never been used, which could have examined all the issues surrounding the application, not merely the local planning matters. Following the Secretary of State's refusal to convene a PIC the major environmental groups decided not to participate.

The reasons for the boycott were fourfold:

- \* objectors were expected to finance their own case when the applicants' case was funded by the taxpayer;
- \* insufficient time was allowed for objectors to prepare their case when the applicants had developed theirs over a number of years;

part were forced to spend much of their time raising money through jumble sales, coffee mornings and appeals. Indeed, even the Joint Islands Councils (Orkney, Shetland and the Western Isles) have been threatened with rate capping if the £3m they spent is not subtracted from their other budgets. The applicants, BNFL and the UK Atomic Energy Authority (UKAEA), have spent about £2m but there has been no suggestion that their other budgets will suffer. (Caithness District Council are reported to be about £20,000 better off from rental charges on Thurso Town Hall!)

## NO DETAILED INFORMATION

During the course of the inquiry the applicants presented new information in response to cross examination or evidence from objectors, despite the Reporter's statement at the outset that he would not tolerate such tactics. This made the objectors' task particularly difficult considering that the applicants maintained that it was the objectors' role to prove against the application despite the fact that it is they who are seeking to change the status quo. Many details of the development have yet to be defined.

The applicants saw no reason for supplying detailed design information because the application was only for

## NO "BENEFIT" FOR UK

The European programme is intended to include three large scale fast reactors and a fuel fabrication plant and reprocessing plant to service them. Based on past experience, it will be decades before the three reactors are operating. This is particularly important for the UK because it is only the third reactor of the series which is earmarked for here.

It follows, therefore, that EDRP could have been operating at Dounreay for nearly 30 years before we have any need for it; 30 years of radioactive discharges into the fishing grounds and the atmosphere of the northern isles without any "benefit" for the people living and working there. And in the process the plutonium recovered by the plant could have been incorporated into French nuclear weapons.

These aspects may kill off the European programme. After Chernobyl most nuclear countries are taking stock. In August Italy, one of the partners in the collaboration, decided against further financial commitment to fast reactor projects and a referendum on nuclear power, the result of which is binding, is likely in the spring. The Germans are also reported to be concerned about the costs of fast reactor developments. So, the whole farce of the Dounreay inquiry could turn out to be no more than an expensive waste of time.

# ICRP Limits Under Fire

The International Conference on Biological Effects of Ionising Radiation, hosted by Friends of the Earth and Greenpeace last November, was probably the first time a range of speakers from both sides of the debate had been present at an event held by the environmental movement. PATRICK GREEN here describes how attitudes within the regulatory bodies appear to be changing.

Out of approximately 180 parties at the conference, 140 were leading scientists or members of the nuclear industry. And what made the event surprising was not only the number of papers which challenged the fundamental principles upon which radiological protection is based, but also the willingness of many of the representatives from the nuclear industry and its regulatory agencies to listen to the arguments put forward.

Presented to the conference were the latest results from the re-evaluation of the Hiroshima and Nagasaki dosimetry. Since 1980 it has been known that these data have needed recalculation and that less radiation was responsible for the observed effects. Consequently the risk estimates used by the International Commission on Radiological Protection (ICRP) needed revision upwards. Professor Edward Radford presented the latest data, which confirmed many people's suspicions that this revision would be at least two times upwards. The difference this time, however, was that the ICRP didn't disagree.

In fact, throughout the two days the ICRP found their figures the subject of intense debate. Professor Karl Z. Morgan, who is widely considered to be the founder of Health Physics, and was one of the earliest members of the ICRP, heavily criticised their stance of the past 30 years, lending weight to the now frequent claim that they are unrepresentative.

Professor Berry, a new member of the ICRP, did his best to defend the organisation's position. His reply to Karl Morgan's allegations was that he isn't responsible for what happened before he joined!

However, he surprised many by his willingness to listen to the alternative argument. In fact, he stated that, before the ICRP issued their next set of recommendations (expected towards the end of 1987), the organisation would first have to consider if the current system of dose limitation had worked. A remarkable statement, considering the ICRP has previously refused to consider the possibility that they might be wrong.

Berry's statement raises the possibility that, in an attempt to maintain their position, the ICRP might consider taking evidence

from trade unions and environmental organisations. This is certainly worth exploring since, whilst it may not achieve anything, as the evidence mounts it is going to be increasingly difficult for the ICRP to do nothing.

One of the central planks in the nuclear industry's arguments is that discharges from nuclear installations only contribute a fraction to a person's annual average dose. Consequently, they argue, they do not represent a health risk.

Prior to the conference, studies on the health effects of background radiation have been inconclusive. However, both Professor Urenjo

accepted.

New evidence about increased incidences of childhood leukaemia around nuclear installations was presented by Dr. John Urquhart of Newcastle University. His survey examined the 14 nuclear plants in England and Wales and found around 10 of them a 35% increase in the incidence of childhood leukaemia between 1969 and 1974. (Further details of Dr. Urquhart's study can be found in the following pages). Sir Douglas Black chaired this session and agreed there was far more evidence available now than when he wrote his Report in 1984.

Chernobyl was also discussed. What became apparent was that in many cases the observed behaviour of the fallout did not fit the models. Dr. Clarke of the National Radiological Protection Board (NRPB) stated that everyone, including the NRPB, had a lot to learn from Chernobyl; he also admitted that the monitoring



Dr. Alice Stewart, Prof. Karl Morgan and Prof. Edward Radford at the Biological Effects of Ionising Radiation Conference.

from Kyoto University and Dr. Alice Stewart from Birmingham University presented papers which showed a link. Dr. Stewart claimed that her study showed that background radiation (gamma only) is responsible for between 66% and 100% of all childhood cancers.

It will be interesting to see the response to these papers once the industry has had time to digest them. Dr. Stewart is, however, no stranger to controversy, and no doubt will not be surprised if the industry tries to discredit her latest work. It is worth bearing in mind that it took nearly 20 years for her work on foetal x-rays to become

services were not set up for a Chernobyl type accident. Following such statements, it is hard to see how the CEBG can continue to maintain that their emergency plans are adequate.

The conference was important in that it established a dialogue. It is now up to us to seize the opportunity whilst it exists and maintain this. It would be naive to assume that progress will come quickly, but as the conference showed, the question is no longer about whether the ICRP will revise their risk estimates, but it is now by how much. We have to ensure that they don't forget this.



# Clusters & Super Clusters

A study looking at 14 nuclear sites in England and Wales shows that 10 have above average rates of young leukaemia in the rural districts surrounding them, and 2 sites were statistically significant. The results were published in a paper by JOHN URQUHART and presented to the Biological Effects of Ionising Radiation conference last November. STEVE MARTIN summarises the paper.

Before the Yorkshire TV programme, "Windscale: the Nuclear Laundry", it was assumed that the amount of radioactivity discharged from nuclear plants could not cause a detectable number of extra cancers, although it was accepted that Sellafield's discharges could cause an increased cancer risk, both locally and nationally. The discovery of five leukaemia cases under 10 over a 25 year period in Seascale aroused considerable public interest: the Government authorised a special study under Sir Douglas Black.

Although the Black Report accepted that the observed numbers were highly unusual, they argued that the discharges were not high

the normal Poisson distribution, and could be called a "super cluster".

A super cluster could be defined as a cluster so unlikely that it should not occur anywhere, let alone in a particular area, such as next to a reprocessing plant. In the Black Report, Doctors Craft and Openshaw found the Seascale figures to have a probability of 1 in 10,000 - a super cluster - and if they had included the last two cases from 1983, the probability would have been less than 1 in 100,000.

A more comprehensive study, looking at over 900 postal sectors in Scotland, was carried out by Dr. Heasman and his colleagues for the

tested and Table 2 shows that, for 1974-78, the Rosyth area reveals another super cluster when compared with equivalent urban areas.

Needless to say, the publication of these figures generated counter claims that clusters occur naturally. Also, other environmental causes of leukaemia have been suggested, and cannot be ruled out. But, the discovery of a second cause would in no way invalidate any significant results around nuclear installations. After all, non-smokers die of lung cancer, but that doesn't mean that smoking doesn't cause lung cancer; and if a second cause of leukaemia is found this would imply that the

Young Leukaemias in Scotland

Area	1968-73		1974-78		1979-84	
	O	E	O	E	O	E
Chapelcross	2	1.19	0	1.14	3	1.11
Dounreay	0	0.48	0	0.47	5	0.47*
Hunterston	3	3.35	5	3.18	6	3.11
Holy Loch	8	5.03	5	4.66	4	4.48
Rosyth	10	9.39	12	9.64	8	9.94

\* Super cluster

TABLE 1

Non-Hodgkins lymphoma, lymphoid and myeloid leukaemia within 6.25km of sites (0-24 age group).

Area	1968-73		1974-78		1979-84	
	O	E	O	E	O	E
Holy Loch	1	0.89	2	0.82	2	0.89
Rosyth	7	5.30	13	4.89*	4	5.33

\* p < 0.0015

TABLE 2

enough to account for the number of extra leukaemias observed.

Could the Sellafield findings be due to chance? Statistical analysis gives no absolute proof of a cause and effect link, but when findings are unusually high (less than 1 in 20 probability of occurring by chance) then it is generally accepted that further study should be made. There was less than 1 in 10,000 chance of the Sellafield leukaemias and lymphomas occurring naturally.

## DOUNREAY SUPER CLUSTER

After the YTV programme there were reports of leukaemia excesses, or clusters, all over the country; some near nuclear sites, some not. Obviously some clusters can occur by chance. For example, looking at 400 cases in 500 areas of equal population there would be about 25 areas where the rate had a 1 in 20 chance or less of occurring, and there would be one area whose level was so high that it would have a 1 in 500 chance. What if an area had an observed rate even higher than the worst area? Such an observation would be outside

Scottish Health Service. One sector in 1979-84 stood out as a super cluster: that containing the Dounreay nuclear plant. As important was their finding that the distribution of all clusters in Scotland as a whole could be accounted for by chance.

They were originally asked to test whether there were unusual levels of leukaemias around nuclear installations in Scotland. They drew circles around the sites and looked for greater than expected levels of lymphoid and myeloid leukaemias within 12½km. Table 1 shows that some sites do have clusters, even if they are not super clusters. Circles of 25km and 6.25km were also

natural level was even lower, making any excess around nuclear sites stand out even more.

The arguments go on, but in the end we need to look at actual rates around nuclear sites, and compare them not only with national levels, but also with similar areas free of nuclear influences.

## NEW STUDY

For six months John Urquhart examined the publicly available leukaemia mortality data, between 1963 and 1980, at the census records office in London. He compared leukaemia death rates under 25 with national deaths and rates in

Comparison of under 25 leukaemia deaths in six-year periods.

	1963-68		1969-74		1975-80		Totals	
	O	E	O	E	O	E	O	E
Urban	81	81.0	78	80.3	71	72.8	230	233.1
Rural	72	62.4	86	64.7	62	56.2	222	183.3
Rural control	32	31.0	23	26.2	28	28.8	83	86

TABLE 4

control areas. His study used information based on local government areas that lay wholly or partly within 12½km of plants known to discharge radioactivity: 8 nuclear power stations and 6 nuclear facilities or radiochemical plants (excluding Sellafield).

The period 1963-80 was divided into three six-year periods as the shorter time is more likely to pick up significant effects.

The test areas were compared with control areas chosen to include all those in urban and rural areas wholly or partly within a circle 12½km away from the plant, the centres of which were chosen to be 50km upwind of the sites. Where these control circles lay downwind of other sites, their centres were placed up to 75km away.

The results are set out in Table 3. Two individual sites were statistically significant: Hinkley Point (probability = 0.04) and Springfields (p = 0.01). Also, it can be seen that there is an excess of young leukaemias in rural areas (p = 0.002).

Not only are the rates in rural districts around the sites significant, but they are also significant against national rural rates. The rural results were also compared with rural districts in the control areas. (Table 4)

Analysing the rural results in six-year periods, it can be seen that the excess at Hinkley Point could be accounted for by the early years, whereas the levels at Springfields remained high throughout the 18 year period (see

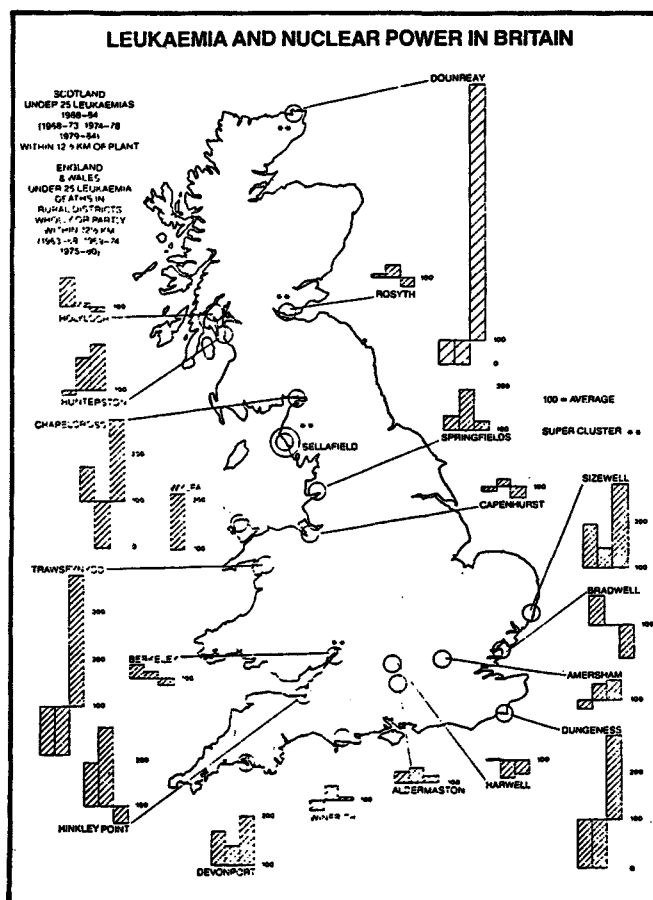


diagram). Of the 14 nuclear plants, 10 had above average young leukaemia rates in the rural districts surrounding them.

A study of national rural districts showed that young leukaemia rates were slightly higher than the national levels, but this excess could almost be accounted for by the extra deaths

and lymphomas incidence, the opportunity for finding further significant excesses exists and beckons.

## SUMMARY

In conclusion the main points are:

- \* In 1983 there was a discovery of an unexplained excess of young leukaemia cases near the Sellafield plant.
- \* This excess lay outside the normal Poisson distribution and could be defined as a super cluster.
- \* The Black Report confirmed an unusual excess of leukaemias and lymphomas near Sellafield.
- \* The hypothesis that average rates existed around nuclear sites was tested by the Scottish Health Service, and they found a further super cluster at Dounreay, and defined in terms of equivalent urban areas a super cluster at Rosyth.
- \* In all other areas the clusters found in Scotland could be accounted for by random clumping but there were raised levels around nuclear sites.
- \* A comprehensive survey of leukaemia death rates around 14 nuclear sites in England and Wales was carried out for the period 1963-80.
- \* A significantly raised rate was found in rural areas.

Young leukaemia death rates by rural and urban districts within 12½km of sites (0-24 age group) 1963-80.

Site	Urban		Rural		
	O	E	O	E	
Aldermaston & Burghfield	25	30.59	58	46.98	p=0.06
Amersham	58	50.73	38	32.88	p=0.15
Berkeley & Olbury	2	1.41	25	22.55	
Bradwell	5	4.42	8	8.77	
Capenhurst	40	44.62	12	12.65	
Devonport	43	42.08	9	5.13	p=0.08
Dungeness	1	1.13	1	0.96	
Harwell	8	5.89	11	14.01	
Hinkley Point	7	5.43	11	5.93	p=0.04
Sizewell	1	0.92	7	4.08	p=0.12
Springfields	28	35.78	32	20.66	p=0.01
Trawsfynydd	1	1.25	1	0.88	
Winfrith	11	8.79	7	6.89	
Wylva (1971-74)	0	0.27	2	0.93	
Totals	230	233.15	222	183.30	
	n.s.		p=0.002		

TABLE 3

# Occupational Exposure Risks

How dangerous is occupational radiation exposure? The ICRP (International Commission on Radiological Protection) set the recommended limits, but scientific evidence suggests they are too high. Here PATRICK GREEN compares the risks in other industries with those from occupational exposure.

Most countries have adopted the recommendations of the ICRP that exposures should be kept "as low as reasonably achievable" (ALARA), and that no individual should receive an occupational effective dose-equivalent of more than 50 millisieverts (mSv) a year.

This limit does not represent a "safe" level; it merely represents the boundary of unacceptability. The ICRP actually state that a 5mSv annual dose is, in their view, acceptable since it confers a fatal cancer risk roughly equal to that of a fatal accident in one of the "safe" industries like textiles.

Using ICRP risk estimates it can be shown that an annual exposure at the dose limit represents a fatal cancer risk greater than the fatal accident risks in the construction, coal mining or quarrying industries (see tables). Yet, the ICRP have consistently refused to recommend lower dose limits in the face of a growing scientific consensus that they underestimate the radiation risks by between 2 and 10 times.

Their response is that a combination of ALARA and the 50mSv dose limit ensures that the average dose is below 5mSv a year; a reduction is not justified.

Occupational health and safety should not just be about averages, it should be about protecting those most at risk. The ICRP claim their system works. The evidence suggests otherwise.

## AVERAGES HIDE THE FACTS

Looking at National Radiological Protection Board (NRPB) figures (\*) it can be seen that 51% of the average occupational collective dose is due to individual doses above 5mSv: at Sellafield the figure is 70%, at nuclear power stations it is 44%; in fact in nearly every case the majority of the collective dose is due to a small number of workers receiving high individual doses. The figures also show that 7% of the CEGB nuclear power station workers receive 44% of the collective dose, 42% of Sellafield workers receive 70%, 13% of UKAEA workers receive 54%, and 21% of Amersham International workers receive 67%.

Are these figures representative of a system that works? Clearly not. The ICRP system allows small sections of the workforce, and not so small in some cases, to receive

large exposures and face larger risks. The talk of averages is just a convenient way of hiding this fact.

The ICRP justify the claim that radiation work is safe by comparing the risk of inducing a fatal cancer with the risk of accidental death in other industries. They ignore the question of whether these risks are also acceptable. Table 1 shows the fatal accident rates in a range of UK industries. Table 2 shows the projected cancer rates for radiation workers at various exposure levels.

### Table 1

Industry	Fatal Accident Rate
Clothing manufacture	0.5
Vehicle "	1.5
Timber, etc. "	4.0
Bricks, etc. "	6.5
Chemicals, etc.	8.5
Shipbuilders, etc.	10.5
Agriculture	11.0
Construction	15.0
Railways	18.0
Coal mining	21.0
Quarrying	29.0
Non-coal mining	75.0
Offshore oil & gas (1967-76)	165.0
Deep-sea fishing (1959-68)	280.0

Annual Deaths at Work (per 100,000 employed) in industries in the UK: average rates for 1974-1978, except as stated.

(From Nuclear Radiation: Risks & Benefits by Edward Pochin. Clarendon Press; Oxford 1983)

### Table 2

Annual Dose	Risk Estimate		
	ICRP/NRPB	2xICRP	BEIR III
1.4mSv	1.8	3.5	7.0
5mSv	6.3	12.5	25.1
10mSv	12.0	25.0	50.0
15mSv	18.8	37.5	75.2
25mSv	31.3	62.5	125.3
50mSv	62.5	125.0	250.1

Projected Fatal Cancer Rates (per 100,000 radiation workers). (From 1983 National Academy of Sciences Committee on the Biological Effects of Ionising Radiation Report.)

Several risk estimates have been used: ICRP/NRPB, doubled ICRP as is likely following the Japanese Bombs dosimetry revisions, and BEIR III Relative Risk. Even the ICRP admit that the relative risk model is a more accurate method of predicting cancer risks. When these two tables are compared it can be seen that radiation work is certainly not low risk. Even on the basis of the average dose (1.4mSv), the risk ranges from being equal to those in vehicle manufacture (ICRP

estimate) up to being slightly less than those in the chemical and allied industries: chemicals is by no means a safe industry.

At the ICRP acceptable dose level (5mSv) the risk ranges from being equal to that in the brick manufacturing industry up to greater than the risks faced by coal miners. A 15mSv annual exposure means that the radiation worker faces similar risks to agricultural workers, or, using the higher estimate, risks equal to those faced by non-coal miners. At the dose limit (50mSv), even using ICRP estimates the risk is greater than coal mining or quarrying and, on the basis of the BEIR III estimate is almost as great as deep sea fishing.

## COUNTERACTING THE MYTH

However, a comparison like this will inevitably be a simplification since one is not comparing like with like. For instance, Sellafield is a chemical works as well, so some workers face both chemical and radiation risks. Industrial radiographers face the risks normally associated with the industry; and the radiation adds a risk above that. Both coal and non-coal miners are exposed to levels of "artificially enhanced" background radiation and so face an additional risk from this. Furthermore, radiation damage is additive, ie. this year's dose is added on to last year's and so on. It is a radiation worker's total lifetime exposure which is important in determining the cancer risk.

The purpose of these comparisons is to counteract the myth that radiation work is safe. It is not. Clearly then, where radiation is used doses should be kept as low as possible. In practice this means a 5mSv annual dose limit and the rejection of ALARA, even then steps should be made to keep doses well below the limit. While at the moment the number of radiation workers who face the highest risks are in the minority they are by no means insignificant and if we don't ensure the dose limits are changed now our plans for decommissioning nuclear reactors will mean higher doses and more workers facing unacceptable risks. This means everyone, and not just a few organisations, must take radiation risks seriously and campaign for a reduction in the dose limits.

\* The Radiation Exposure to the UK. Population: 1984 Review. NRPB-R173; J. S. Hughes & G. C. Roberts, November 1984.



# Hot Metal !

The European Communities' Commission held a conference, in 1984, on the "Decommissioning of Nuclear Power Plants". The conference proceedings raise two new radiological issues. IAN LEVESON examines the papers presented on the recycling of scrap metal from decommissioned reactors.

During the operation of a nuclear reactor, parts of the reactor building become contaminated with radioactivity. This results either from the effects of radiation escaping from the core, or from the movement of contaminated fluids or gasses in the plant. When a reactor is shut down, responsible operators continue to manage the contaminated remains. The procedure for managing nuclear reactors after their closure is known as decommissioning.

Decommissioning is envisaged as falling into three stages:

- \* closing down and defuelling the reactor, making the building safe;
- \* removal of all plant excluding the biological shield and reactor core;
- \* removal of the reactor and rehabilitation of the site for new uses

The commissioning of new reactors peaked in the early 1970's, thus most of these will be closed in the early years of next century. Full decommissioning will not necessarily occur until much later. (See SCRAM 47 for more detail).

In most industrial demolition jobs, scrap materials are recovered and sold for their scrap value. Scrap from nuclear reactors is no exception. Whilst much of this is not notably radioactive, and therefore not contentious, some of the material will be contaminated with radioactivity. An outstanding feature of the conference was the level of interest shown in "decontaminating" the material which had been exposed to radioactivity. Whilst some of the

decontamination is intended to render the plant safer for the workers demolishing it and packaging the remains for disposal, some is to be carried out to reduce the quantity of radioactive material and to free some for re-use as scrap.

Three types of contamination of reactor plant exist:

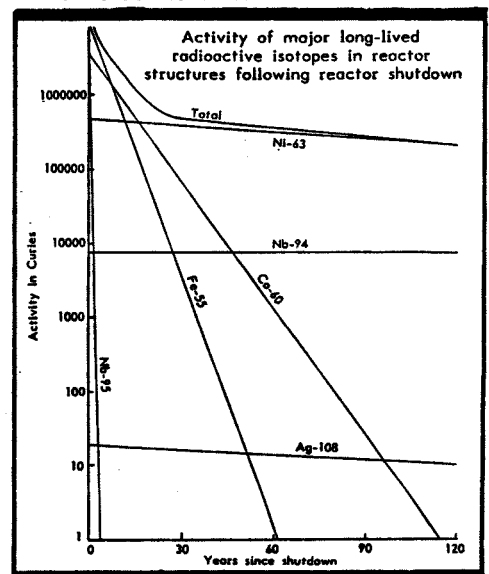
- \* radioactive deposits on the surface of the plant;
- \* migration of radioactive material through the protective layer, with which the components are coated, into the structural material underneath;
- \* radiological "activation" of the reactor components, principally by neutrons escaping from the reactor core, but also by the passage of contaminated gases and fluids through the plant.

The first two forms of contamination may be amenable to decontamination of the surface layers, the latter two may involve more sophisticated "reprocessing" of the scrap material to separate the less contaminated material and to isolate the radioactive elements. An alternative approach for the latter is to wait for radioactive decay to reduce the level of radioactivity to levels which are deemed acceptable (see graph). However, some of the potentially valuable material, eg. steel, often contains long-lived radioactive elements, so it is not practicable to wait until they decay.

Decontamination of the surfaces of the plant raise questions about the radiological impacts of this activity. Like reprocessing of spent nuclear fuel, the desire to reduce

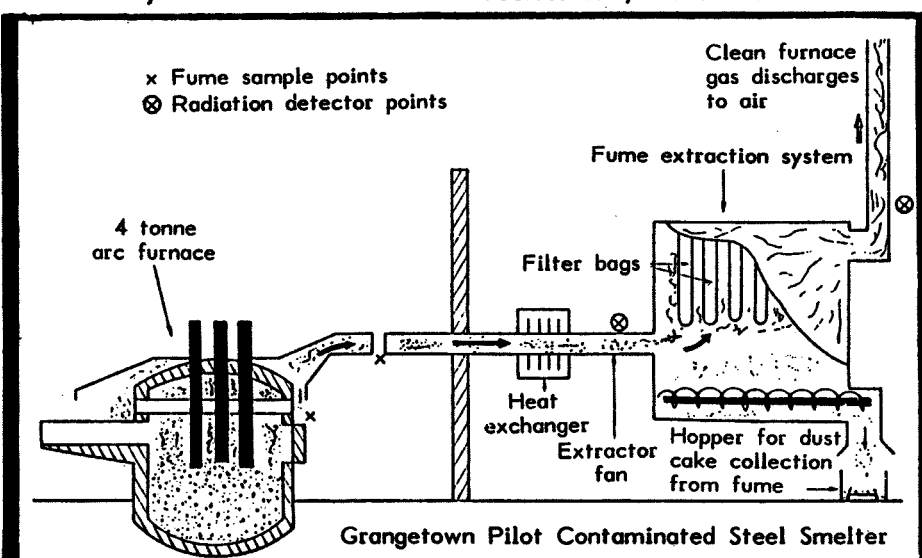
the volume of high level radwaste may produce large volumes of low level waste. New techniques are to be developed to control the exposure of workers: several conference papers were devoted to the question of controlling the level of contaminated dust. The new and more serious issue is how scrap materials are decontaminated, the impacts of doing so, who is likely to be exposed to radioactivity during recycle, and what standards should be set to ensure safety during recycling.

One example quoted was the recycling of 50t of steel and 30t of brass from the reconditioning of the nuclear reactor at Wurgasser in W. Germany. British Steel (BS) was represented at the conference. Among others, they have been examining the potential of removing radioactive cobalt and caesium, from activated steel, in the slag produced when steel is smelted.



Although this process was reported not to be very successful for cobalt (p314), Mr. Gower of BS said that they intend to recover steel in this way as a commercial operation at ordinary furnaces, "providing the industrial relations aspects can be settled" (p358). The transfer of radioactive waste into the slag could cause disposal problems: "This seems not to have been the case at BSC, where, up to now, slag can be freely disposed of." (p358)

It is quite clear that decommissioning will cause radiological hazards in the scrap metal industry, where they have not been an issue before. The sources of radioactive waste will also widen as will the types of radioactive waste materials. New groups of workers will be faced with radiation exposure as an issue.



\* "Decommissioning of Nuclear Power Plants." K. H. Shaller & B. Huber (eds.); published by Graham & Trotman Ltd (Sterling House, 66 Wilton Road, London) for the Commission of the European Communities. 1984, 449pp, £46.

# Euro Waste Research

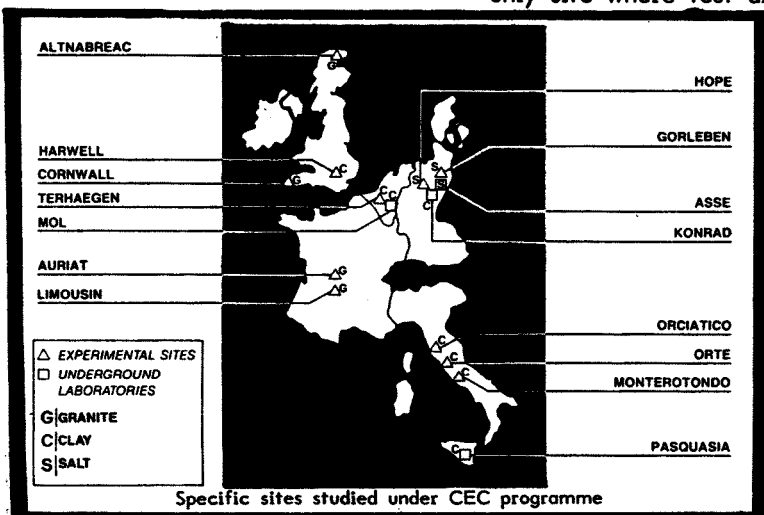
Many countries have nuclear waste dumping programmes. They are at different stages of development, are looking at different rock types and are considering different types of waste. The following article by PETE LENNARD reviews three papers on clay research presented to the Second European Community Conference on the issue, held in Luxembourg in April 1985. (\*)

In at least three European countries the authorities have taken advantage of existing nuclear research centres to test beneath them for the possibility of disposing of nuclear wastes on these sites: in Italy at La Trisaia, in Belgium at Mol and at Harwell in the UK. The first two have been declared as possible dumping sites, but the status of Harwell is unclear; it may be just to gather information for future site selection.

disused Pasquasia potash mine in Sicily has also been established, to provide information on other rock types. It is not clear which type of wastes are to be buried, but experiments on the effects of heat and heat transfer suggest that high level waste is not excluded.

## Britain

Until recently Harwell was the only site where test drilling in clay



had been carried out (granite test bores have been drilled at Altnabreac in northern Scotland), because of local council refusal to allow test drilling.

The Government have now overruled the councils and have granted Special

## Belgium

An underground laboratory was completed in about 1983 beneath the Mol nuclear research centre. The first research was of a geotechnical nature, to establish whether waste disposal was generally feasible; economic feasibility was also considered.

Other research programmes include "corrosion, hydrology, backfilling, migration, etc." There has been an extensive hydrogeological survey in the region, involving "numerous boreholes" over an area of 2500m<sup>2</sup>.

Belgium considers clay to be the only option for the final disposal of High Level and other long lived wastes.

## Italy

A nationwide clay research programme followed the late 1960s research beneath the clay of the La Trisaia Nuclear Research Centre. A full list of sites is not available, but some sites have been named; the site to be chosen will be revealed by this survey.

An underground laboratory at the

Development Orders to allow the drillers onto four new sites. Protestors successfully prevented access for two months until legal action was taken.

The four Harwell boreholes were filled with water and the fall in the rate of seepage was recorded over time. Regional examination of groundwater flow as far away as the Thames was investigated by modelling.

## Germany

The Konrad iron ore mine, 10km south west of Braunschweig, has been used for extensive tests since 1976. In 1982 an application was made for a licence to use the mine as a repository for nuclear waste. It may take "up to spring 1987" to obtain the licence, whereafter construction would take another two years, allowing disposal to commence in "early 1989."

Wastes to be buried would be low level including contaminated parts of decommissioned nuclear reactors. There is also an underground laboratory at the Asse salt mine.

Apart from whether tests carried out over a few years can have any validity for a nuclear waste dump required to remain safe for a quarter of a million years, other problems were discussed at the conference. What would be the effect of oxygen on the organic material in the clay that had previously been protected from it for millennia; and what consequences could result from the possible release and build up of hydrogen?

It is possible that oxygen could have the effect of making the clay less permeable. Also, sinking a shaft may require the freezing of the clay, but this changes it, possibly making subsequent tests invalid.

## EARTHQUAKES & ICE AGES

Brondi's paper considers the possibility of contamination of groundwater due to faults in the clay caused by earthquakes (eg in Italy) and the effects of a mini ice age (quaternary) on a burial site (eg Belgium and Britain). In the context of nuclear waste, the next ice age is described as "in the shorter term." The paper states:

"The impact of glacial action appears to be capable of not merely causing the geological barrier to give way, but also of dispersing the radioactive material into the environment."

and:

"Risk analysis conducted on Boom clay [Belgium] shows that tectonic evolution of the site and development of a new glacial phase may rule the stability of the waste deposits."

In other words, future earthquakes and ice ages may make all the current tests on pressure, permeability, heat transfer etc. totally irrelevant, as future geological occurrences could release the radioactivity.

It is ironic that future generations may be able to adapt to, and survive, another ice age, but could succumb to radioactive pollution because of the stupidity of their forebears.

\* "Radioactive Waste Management and Disposal." R. Simon (ed.); published by Cambridge University Press for the Commission of the European Communities. 1986, 734pp, £50.

The three papers reviewed are:

"Research programmes in underground experimental facilities: Konrad - Pasquasia - Mol." Manfroy, Benvenuto, Heremans, Brewitz. (p 468)

"Characterization and behaviour of argillaceous rocks." Bonne, Black, Gera, Gonze, Taroni, Thimus. (p 487)

"Natural evolution of clay formations." Brondi and Polizzano, Bonne, D'Alessandro. (p 506)

# On the Crest of a Wave

Norway has almost concluded its first overseas sales of wave power units, just one year after launching their prototypes. DAVID ROSS visited the country recently, and here he asks why is Britain lagging behind.

"The municipality is satisfied to see that the wave power plant is operating as intended. In November 1985, the Oil and Energy Minister pushed the button to start the turbines. Since then, hundreds of interested people have visited the site from near and far, even representatives from China. The environmental impact is very small - no negative influence has been registered so far and we believe there will be none in the future. On the contrary, the number of tourists has also increased with the fulfilment of the road. Many extremely good locations for fish farming and harbour construction make Oygarden especially suitable for activities attached to the sea. New technology means that exploitation of wave power may well mean new activities in coastal districts. Up to now it has given promising results - it works, making electric energy from the waves."

This was the wording of the welcome notice from the Mayor of the local Kommune, the county of Oygarden, given to visitors to the Norwegian wave power station on an island near Bergen. It is the straightforward reaction of the people of the rural community who have suddenly found themselves hosts to a world innovation in energy.

The reference to fish farming is significant because wave energy, with its oxygenated lagoon, lends itself to that form of farming. The welcome could have been from a Scottish coastal community, if the British Government had not taken the foolish step in 1982 of shutting down our wave power programme, on which we were at the time leading the world.

## OVERSEAS SALES

In December I visited the site for the third time; 70 VIPs including 5 MPs, representatives of electricity boards and the Department of Energy and others were also invited. For the first time on a formal visit the sea behaved well! There was a good swell and the Tapchan (Tapered Channel system - see SCRAM 51) was performing well, sending a water spout to five times the waves' natural height. All the visitors were repeatedly soaked.

There was good news: the Norwegians have virtually sold the

first two units. A 1MW Multi-resonant Oscillating Water Column (MOWC) will be built on the Azores and a 1½MW Tapchan is destined for an Indonesian island, probably Bali. This is the success they have been waiting for and is a tribute to the prototypes that they have concluded commercial sales only one year after their launch.

So the occasion should have been a happy one. There were, however; some visitors who were less impressed. There were a number who commented - fairly enough - that the MOWC made a loud hooting noise, and one of them wondered what environmentalists would say if a nuclear station was as noisy. Our hosts pointed out that normally it would be moored at sea where the noise would disturb nobody (and would actually be an advantage as it could serve as a free foghorn for shipping!).

## NSHEB KILLED UK WAVES

If it is built on land, it would need to be in a rural area, as is the prototype, and the sound does not carry far enough to disturb anyone. Also, there are many ways of reducing the noise by putting a jacket round the structure and adjusting the air turbine design.

The Tapchan, with a water turbine, makes no sound at all. However, it is right that objections should be admitted: no supporter of renewables would wish to repeat the conduct of the nuclear lobby which oversold its new miracle (electricity too cheap to meter). There are, and will be, problems to overcome with the large scale development of a new technology, and it would be silly to disguise it.

However, that is different from seeking to kill it off as our Government did, with the encouragement of the electricity authorities. One discovery I made was the ardent support for nuclear power among leading figures in the NSHEB. Previously, they had appeared, with no nuclear power of their own and a splendid record in developing hydro power, to be the best of the three generating boards.

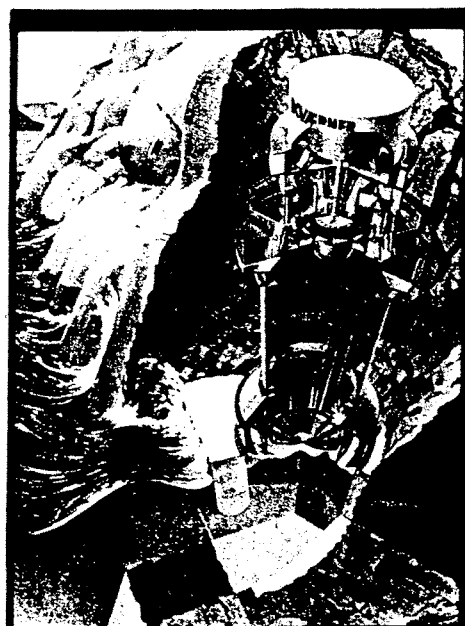
However, what became clear is that they have a major stake in Torness, and are devoted to nuclear power. It is therefore worth considering their role in announcing unexpectedly the decision to link the island of Lewis to the grid just at the time when it might well

have been the site for a wave station, financed by the Board and a consortium of private companies and designed by the National Engineering Laboratory at East Kilbride. The cable link was the death blow. It was not clear at the time that the NSHEB had a nuclear link: now it is.

## NORWAY TAKES THE LEAD

The important thing is wave power has survived a savage attempt to kill it off. That assault was successful in Britain but Norway was able to mount a programme, build two prototypes and start to sell units to other countries on a commercial basis. The Norwegians' own estimate of the cost is 2.5p a unit (using the British discount rate of 5%). They now plan to scale up by a factor of 10, and will complete two more units, with a combined capacity of 10-15MW, by 1990. A further scaling up, to 100-150MW, is expected by 1995; and they have a good record of meeting deadlines.

They will soon be able to offer wave electricity to their unfortunate neighbours, Sweden and Finland, who



The MOWC system

decided to rely on nuclear, and face a major energy crisis as a result.

Britain has, according even to the CEBG and the Department of Energy, an enormous potential once we overcome the opposition of the energy establishment. And when we at last decide to go ahead, wave power could provide tens of thousands of jobs in the steel, construction, shipbuilding and electricity supply industries.

Why are we waiting?



# Energy Committee looks at

Major obstacles and disagreements between the Electricity Supply Industry (ESI) and those bodies promoting Combined Heat & Power (CHP/DH) have been revealed following the publication of the deliberations of the House of Commons Energy Committee. PETE ROCHE reviews the evidence presented to the Committee.

The three studies currently being carried out into the commercial viability of CHP/DH in Edinburgh, Belfast and Leicester are due to be completed in April 1987. To ascertain their progress the Energy Committee heard evidence over the summer.

The first major obstacle is that, under present provisions, there would be an imbalance between the rates to be paid by a CHP organisation and the much lower rates payable by gas and electricity utilities. This single factor could be crucial to the economics of CHP/DH. Fortunately Mr. Hunt, the Minister responsible for CHP, was able to tell the Committee that his colleagues responsible for rating policy have agreed in principle that the schemes should be rated by reference to the formula used for the ESI.

## "FAIRLY BORING"

There have been differing levels of enthusiasm in the lead cities from public bodies, which have caused some problems. In Lothian Regional and Edinburgh District Councils there is all party support for what is seen as a desirable objective. However, in Belfast, where most local authority functions are run from the Northern Ireland Office, the Northern Ireland Housing Executive have been less than helpful. They are proposing to dismantle an existing district

heating scheme in Belfast and have been rubbishing the idea of District Heating to their tenants.

New legislation to permit local authorities to act as investors in, and part owners and possibly part operators of the CHP enterprises will be required. It is important that this comes quickly to maintain the interest in CHP. The main block still to be overcome is whether private finance can be raised. Financial advice so far received by the lead cities describes the investment opportunity as "fairly boring."

In Belfast and Edinburgh the power stations would be owned by the relevant utility, so an acceptable method of working out the price for the hot water has to be agreed. In Leicester the problem is reversed: how much will the East Midlands Electricity Board pay for the electricity? A figure index linked to fuel price will be needed in Leicester to ensure a secure investment. There is also a danger in all three areas that a privatised Gas Board may start a price war against District Heating.

## BENEFITS OF CHP

The National CHP Liaison Group, which includes the lead cities together with several London Boroughs, Newcastle, Sheffield, Hull and the CHP Association, gave evidence on the benefits of CHP. It is believed to be the most energy

efficient route for the UK and it is estimated that £350m a year could be saved on the balance of payments by the 1990s.

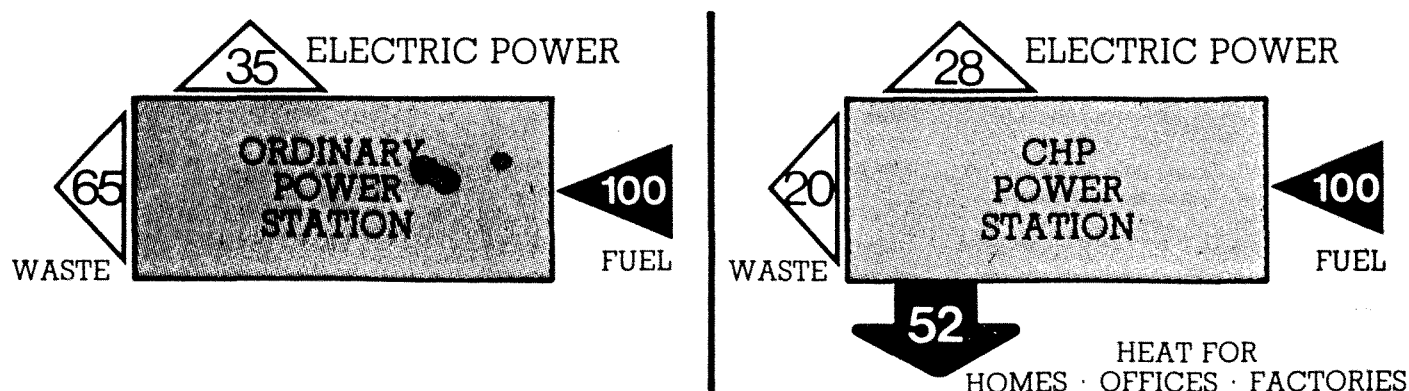
We have 2½ million dwellings prone to severe condensation, and £18 billion is needed to repair public housing stock, £4 billion for thermal upgrading alone. CHP could supply the heat to alleviate condensation and fuel hardship, and would create the opportunity for embarking on a major thermal upgrading to ensure that the homes supplied were energy efficient. The provision of reasonably priced heat would also help to improve the commercial viability of inner cities. Newcastle have estimated that, for every 1000 homes connected to the heat system, there would be 200 person years of work created.

## TARIFFS UNFAIR

The 1983 Energy Act requires the ESI to "adopt and support" CHP, but the CHP Liaison Group claim that city scale CHP will never be achieved until the ESI's role is better understood. The Central Electricity Generating Board (CEGB) assume that CHP will displace nuclear stations, which has the effect of penalising it: they were proposing to sell heat at 30p/therm when gas was only 32p/therm. Also, the Treasury's Test Discount Rate requires that major power station construction meet a 5% return on investment, whereas privately funded CHP is likely to require a 15% return.

The CHP Association's Tariffs Forum believe that the ESI has wrongly interpreted the 1983 Act in fixing tariffs: they act as judge and jury in setting the price they pay for independently supplied

## Diagram illustrating benefits of CHP



# CHP

electricity. In the US the Public Utility Regulatory Policy Act requires the Federal Energy Regulatory Commission to set rules "necessary to encourage cogeneration and small power production." The CHP Association argue that there is an urgent need for a UK independent standing authority to review tariffs; an increase of 20% may be justified for some independent electricity suppliers.

The crux of the disagreement between the Tariffs Forum and the CEEB lies in the definition of "avoided cost". A memorandum from the Electricity Council states that Sizewell B's electricity is valued at 5p/kWh, whereas last year's tariffs for private generators averaged out at 2.7p/kWh. With a potential payback period of only 16 years, and a tariff of 2.7p/kWh, it is plain that CHP schemes appear to be more economically attractive than Sizewell B. And, if electricity from Sizewell B were valued at the lower figure, it would certainly not meet the investment criteria of either the private sector or the ESI.

## "WET BLANKET EFFECT"

Finally, Mr. Hunt's evidence failed to show the Government's willingness to commit more finance to lead cities:

"... within the total spending power available to them, local authorities have a high degree of freedom to select their own spending priorities. It is, therefore, a question of how important the local authorities see investment in CHP/DH."

He was, however, able to point to a loophole: the Energy Efficiency Office have published "Guidelines for Local Authority Shared Savings Energy Performance Contracts," which deal with the use of energy management companies to take forward efficiency schemes in local authority buildings. With a suitable structured contract the expenditure involved can count as non-prescribed expenditure, ie. capital expenditure which doesn't score against local authorities' resources. We should be grateful for small mercies!

It has been a hard struggle to get CHP/DH off the ground in this country, and there is still a long way to go. But, we now have a group of people who are committed to seeing it through. They are building up experience and a momentum which will be too difficult to defeat. The Government's "Wet Blanket Effect" may finally be drying out.

## Appropriate Technology

### Combined Heat & Power

The Energy Committee's report on Combined Heat & Power Lead City Schemes (see facing page) was published at the end of October. Its main conclusions were:

- \* There should be no arbitrary reductions in the number of cities given grant aid, provided they meet the necessary economic criteria.
- \* If the Government's purpose is genuinely to encourage the growth of alternative suppliers, it must seek ways to ameliorate the effects of the imbalance between the criteria for public sector investment and those applying to joint ventures. One way to achieve this would be to enable the Area Boards to meet suppliers' need for stable long-term contracts.
- \* The Northern Ireland Office should aim to ensure that the Government's Lead City Scheme is given a real opportunity to work.
- \* The evidence appears to indicate that the Energy Act, meant to encourage CHP, has actually had the reverse effect.
- \* Where the market has shown itself to be imperfect, the Government must act to change some of the factors which cause these imperfections.
- \* The Committee recommends that the relevant legislation is amended to make clear that the combined production and sale of electricity and heat is a proper function of the electricity supply industry.
- \* The Committee recommends that an independent tribunal, chaired by a person of judicial standing assisted by technical assessors, and with a permanent secretariat, be established by Act. They would arbitrate on disputes on the setting of purchase and transmission tariffs and terms for privately generated electricity. Their functions should include the determination of appropriate long-term agreements.
- \* They recommend the establishment of a CHP Office within the Department of Energy. It should engage in more than the purely coordinating and technical role; it should also be involved in examining the macro-economic aspects of CHP (eg. potential for savings in the social security budget).

Muddled by megawatts?  
Baffled by becquerels?  
Uncertain about uranium?

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## Conservation

"Sid" should be telling the gas industry to conserve energy instead of increasing energy supply, according to the Charter for Energy Efficiency.

The call came at national seminar on energy efficiency in local public sector housing, held in Newcastle in November. Mr. Ted Rowlands MP told the conference that an energy conservation agency should be an immediate priority, not just to promote conservation, "but to formulate and implement the necessary investment to back it."

The conference heard that the regular crisis of cold homes could be stopped by investment in energy efficiency, which would have the added benefit of creating employment.

	Cost	Saving (% of normal energy consumption)
Full scale	\$913	14.7
Small scale	\$618	9.2
DIY	\$41	Nil
None	Nil	2-5% increase

## Geothermal

The Tyne Tees area is being studied by the British Geological Survey (BSG) for potential sites for geothermal exploitation.



The survey is intended to utilise the experience gained from research at the Camborne school of mines in Cornwall (SCRAM 54). It is hoped that the Camborne experience will provide ways of drilling through rock at the temperatures above 200°C needed for electricity generation. Even if these temperatures are not encountered, then the area's high population will facilitate the use of hot water in District Heating schemes.

The Tyne Tees area has several features which make it a viable area for geothermal exploitation. Apart from the from the population density, a mass of granite is sited relatively close to the surface. Additionally, this is covered by a layer of sediment.

For exploration to be economically viable, it is important that the heat bearing rock is close to the surface, as the cost of drilling increases disproportionately with depth. The heat gradient also needs to be large, so that the water produced will be usable in electricity generation. Granite has just such qualities. The layer of sediment acts as a sort of geological loft insulation, keeping the heat in.

● A new study from the Association for Conservation of Energy (ACE) shows that home insulation on the cheap does not work.

The study was carried out in the US, where three types of insulation were examined: full scale insulation of walls and roofs, with draught-proofing and modification of heating systems where appropriate; draught-proofing, loft insulation and jackets for hot water tanks; and thirdly, DIY draughtstripping with hot water tank jackets. A fourth group which had no improvements were used as a control.

Although the full scale programme cost about a third more than the second group (see table), the saving was over half as much again. The group which received minimal modifications spent considerably less, but made no fuel savings.

As the bad weather strikes Britain and people start dying from cold yet again, this study serves to emphasise that such exercises as Monergy year, are no more a public relations con. The Government is piously prodding industry into altruistic energy economy, when the real savings, both in terms of lives and money are to be made in full scale home insulation.

● According to a new Government report, the cost of electricity generated from hot dry rocks, could be as low as 4.2p/kWh. The report, prepared by Professor Richard Shock, of the Energy Technology Support Unit, comes at a timely moment for Camborne, whose future funding is being discussed

## Wind

Reports that the Hydro Board's wind generators on Orkney are causing TV interference, have been denied by the manufacturers.

The North of Scotland Hydro Electric Board (NSHEB), have three windmills at Burgar Hill, Orkney: two small machines, rated at 250 and 300kW, which have been turning for over a year, and a larger, 3MW machine, should be rotating by mid February. The 250kW and 3MW machines were built by the Wind Energy Group (WEG) and the 300kW machine by Howdens of Glasgow.

### WINDY INTERFERENCE

It is the Howdens machine which is reported to have caused the interference (New Scientist 27 Nov). Apparently the BBC and IBA were "deluged with what they tactfully describe as 'vigorous complaints' from viewers," serviced by the Keelylang Hill transmitter. A spokesperson for Howden was however surprised when contacted by SCRAM, as the generator was installed in 1983, and the problem was "easily resolved."

According to Howdens, it is not the generators which are at fault, but the fact that the area is on the edge of the transmission range, making TV and radio signals weak. So when the generator was erected, phase differences occurred in the signal, which caused interference. A stronger transmitter easily resolved the problem.

SCRAM is curious as to why the report should appear now: over three years after the event.

## LATEST PUBLICATIONS FROM FRIENDS OF THE EARTH

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## Solar

### PHOTOVOLTAICS

The emphasis of proposed West German research into photovoltaics has surprised the European Commission.



The Germans are interested in the flexibility of photovoltaic systems, which allow a modular approach to power generation. This means that the same components and systems used for generation in isolated areas could be utilised in large power stations. At least seven German companies are understood to be engaged in research, funded by the German Research and Technology Ministry (BMFT).

It is the Germans' emphasis on large systems that is puzzling the Commission, who have concluded that photo-technology is at a stage where it is better suited to remote areas than large scale supply to the grid. They point to Spain, which is the world's second largest photovoltaic market after the US, where a total of 1.6Mw is generated, mostly from 60-120 watt arrays for isolated houses, unconnected to the grid.

### SOVIET SUN POWER

The first commercial scale solar station in the USSR came on line in late December

Situated near the village of Mysovo in the Crimean peninsula, which receives an average 2320 hours of sun a year, the station has a capacity of 5MW.

The plant uses 1600 computer controlled mirrors, each with an area of 25 square metres, to track the sun. These are focused on a steam generator on top of an 89 metre tower. Excess hot water is stored under pressure for use during cloudy periods.

The Soviets estimate the cost of the generated electricity as twice that from conventional plant, but point out that this is remarkably low for a pilot project.

### SOLAR FURNACE

● Plans are also under way for two new stations in the Soviet state of Uzbekistan, which enjoys some 3000 hours of sunlight a year. The first of these will be a 300MW version of the Crimean plant. The second is a solar heated furnace, which it is hoped will be able to attain temperatures of 3500°C. It will be used to smelt metals for uses that require a high degree of sterility and purity.

## Waste

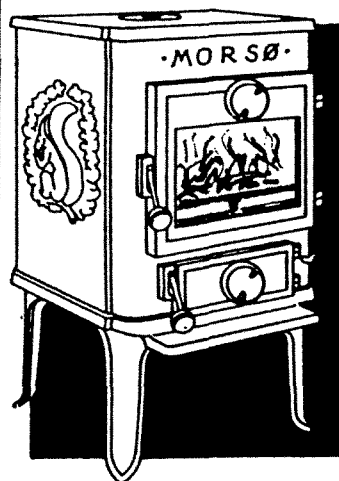
### CLEANING DIRTY WASTE

Toxins released during refuse incineration for heat generation are a serious problem, but a new Swedish process seems to have found the cure.

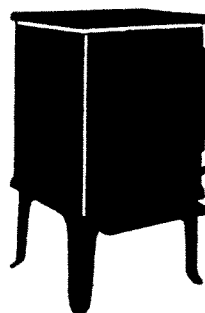
The relatively simple process, is claimed to have reduced poisonous emissions to a level where they are "hardly measurable," at a pilot plant at Linköping in Sweden. The problem is compounded by the large number of toxins present in modern waste. If only one substance was involved then the solution would be considerably less complex.

Previous solutions have involved wet separation of toxins from the effluent gasses. This has only served to change the nature of the problem from one of atmospheric pollution to water pollution. The new process involves dry separation and results in only a few pounds waste being produced from a tonne of refuse.

The Swedish solution, known as "Drypack," has the advantage of being technologically very simple. After the refuse is burnt, the gasses produced are cooled and mixed with lime dust. Toxins, such as heavy metals and dioxins, bind onto the lime. The gas and lime are then passed through a bag filter and the residue compacted into easily manageable balls.



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# Reviews

Green Teacher issue 1, Oct. 1986. £10 sub for six issues from: Llys Awel, 22 Heol Pentrerhedyn, Machynlleth, Powys SY20 8DN.

Critical Mess, the Real Costs of Global Nuclearization: Links no. 26. £6 sub for four issues from: Third World First, 232 Cowley Road, Oxford.

Chernobyl, The End of Nuclear Power?: The Ecologist vol. 16, no. 4/5; 87pp, £5. Worthyvale Manor Farm, Camelford, Cornwall PL32 9TT.

Green Teacher sounded like a good idea when the publicity launch started earlier in the year. The first issue is visually disappointing, but the contents are very good. It looks as if the picture for the front cover got lost on the way to the printers, and the use of green type throughout makes the contents very difficult to read.

The editorial approach is to help educators to develop their own and their students' skills in co-operating with and caring for the earth and each other; growing as independent, self-reliant, confident individuals; designing and using technologies and lifestyles towards a sustainable society; and working out new ways of doing politics that control their future.

This is a global magazine, with contributions from Australia and the US, as well as England and Wales.

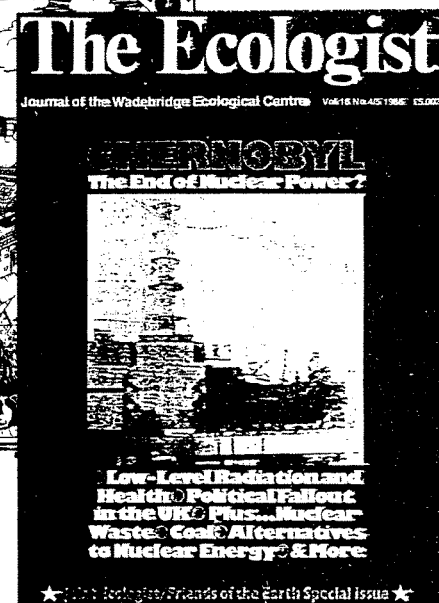


While not all the contents relate specifically to energy, they certainly describe the "paradigm shift" cultural context a renewable energy future fits into.

In contrast, *Critical Mess* is glossy, professional and authoritative looking. But the world map on page 18/19 misses out half the uranium mining sites, although a table on page 17 mentions some of those missed out: do more people read tables than

maps, or vice versa? Also, SCRAM's Edinburgh phone number is prefixed by 01- when it should be 031-.

These errors aside *Critical Mess* is excellent for giving to not-quite-anti-nuclear-but-Chernobyl-made-me-think-about-it-a-bit relatives and friends. It has facts, shock and horror without being too wordy or technical.



*The Ecologist* is a heavy weight anti-nuclear fact mine no activist should be without. I particularly enjoyed the incident from 9 June 1985 in Jim Jeffrey's paper, "The Unique Dangers of Nuclear Power". At Davis-Besse facility on Lake Erie this classic John Cleese script actually happened:

"technicians were able to turn on an auxiliary water supply (after rushing down four flights of stairs, unlocking padlocks, putting fuses into an empty fuse box, manually switching on a pump, and struggling with a wrench to open some critical valves). The staff got things under control moments before it would have been necessary to go into an emergency cooling routine."

Doesn't that reassure you!

Richard Webb shows how the West's PWRs and BWRs are more rather than less dangerous than Chernobyl; Peter Bunyard and Graham Searle provide evidence that the effects of radiation on human health have been underestimated by at least a factor of 10; Ivan Tolstoy describes how the high level waste problem cannot be solved; and Jean Emery tells a powerfully sad tale of people who worked at Sellafield and died young.

Buy this issue of the *Ecologist* NOW, read it, assimilate it, and pass it on.

LINDA HENDRY.

Death of the Rainbow Warrior by Michael King; Penguin. 254pp, £3.95.

Following the bombing of the Greenpeace flagship, *Rainbow Warrior* in July 1985, there has been a host of books on the subject.

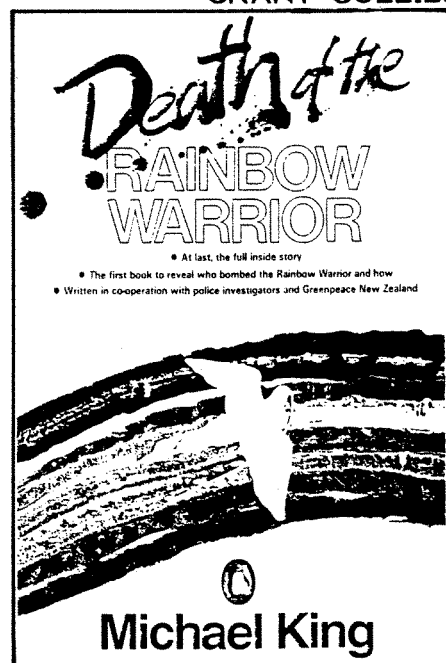
This latest offering attempts to give the background to the whole affair, from the reasons behind the attack and the build up to it, to the "escape" of the team of saboteurs.

Michael King has a valuable insight into the workings of both the French Secret Service and the New Zealand Police, which helps him to describe in detail the timetable of actions leading to the atrocious act. He also seems to have built up a working rapport with the people most involved in the events which enables him to write in a way which puts the facts forward in a personalised manner, making it highly readable.

I recommend this book to all with an interest in State Terrorism, Greenpeace, International Law, or just

an enjoyable read.

GRANT COLLIE.



### Women Living the Strike by the Lothian Women's Support Group. 63pp, £2.

This book is an account of the 1984-5 miners' strike, as seen through the eyes of miners's wives. Sixteen women from the various support centres in Lothian describe, each in her own words, what it felt like. Getting involved; keeping the home going and feeding the kids on £17 a week; running the soup kitchens; going on picket lines accompanied by young children, where women often faced crowd violence; and then seeing their men going back to work - except for the unlucky miners who were victimised.

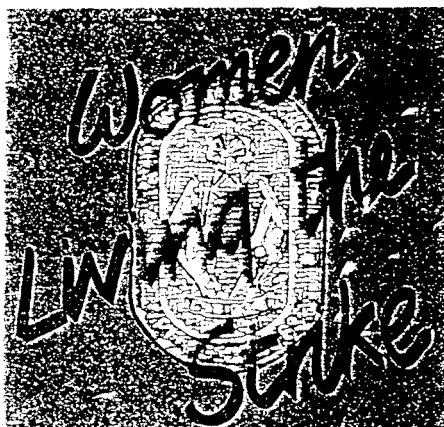
The account is valuable as a history of the people, written by the people. History, as recorded by academics and journalists, can be once removed from the events; sometimes there are political axes to grind and vested interests to protect, and we are given a one-sided picture of how things were.

During the strike the now victimised miners were shown as hooligans, deserving to lose their jobs. Reading this book, we discover that most of them were simply union activists; it was expedient for them

to be arrested and imprisoned.

"Only a small number of miners arrested were charged and found guilty of violent behaviour. In most cases men were snatched because the police had books of photos of those men they wanted to arrest ..."

"The public never heard the men's cases when they came to court. The NUM's lawyers often had the police



tongue-tied. There were cases when one police officer's story was completely different from the next's ..."

"When Davy Hamilton was on remand at Saughton Prison he had to wait 65 days before he was given a

trial ... When he finally got to trial it took the jury just 25 minutes to find him innocent!"

In Nicaragua after the revolution, the Sandanista Government felt it was important for the people to rediscover their own history, recording the lives of those, often children, who had died to create a better and fairer world. The repressive Samosa regime had completely written out the existence of Sandino and his early followers from the official history.

I believe that we too can gain a more complete and balanced understanding of our own history by reading a book like "Women Living the Strike". We can indentify with the women's hopes and fears, admire their courage and commitment and discover the incredible solidarity that existed during the strike.

The issue at the heart of the strike is one which vitally concerns us all; the miners' struggle was a struggle for the future of us all. The tragedy is that, because many failed to see it as such, a vital energy resource has been decimated, and innocent men have suffered victimisation. We can do our bit to help them and their families now by buying this book. All proceeds will go to the Lothian Women's Support Group.

OLWEN MARTIN.

### Green Britain or Industrial Wasteland? by Edward Goldsmith & Nicholas Hildyard (eds); Polity Press. 374pp, £6.95.

Did you know that the pesticide 245T is so toxic it is banned or severely restricted in almost every country except Britain? Or that, because it would have to meet a certain basic standard of hygiene, Blackpool is not classed as a bathing beach?

You would if you had read this absolute cracker of a book. These two facts are quite mild compared with some of the shockers it contains in a series of 34 essays from 28 contributors. Subjects range from mackerel to pesticides, from acid rain to asbestos, and the future of the Green movement.

Nuclear power is well represented. Chapters deal with the discharges from Sellafield, a well documented account of the effects of radiation on health, Jim Slater on why the NUS refused to dump waste at sea, a history of Britain's plutonium exports, and the true cost of nuclear power.

The book scores on all points: bright cover, easy to read chapters, and nice and floppy. This is important because this is very much a book that you will find yourself coming back to again and again. It's good to flip

through when you have a quiet five minutes, and the depth of information contained in the relatively short sections means you can learn all you

ever wanted to know about the hazards of high voltage power lines (if you live under one - move). It also gives a list of sources at the end of each section, which is very handy for further research.

When I got the book I thought it would be disjointed and patchy with so many topics, but I read it through in one. Each section seems to lure you on to the next, and they are held into a cohesive whole by the very strong introduction.

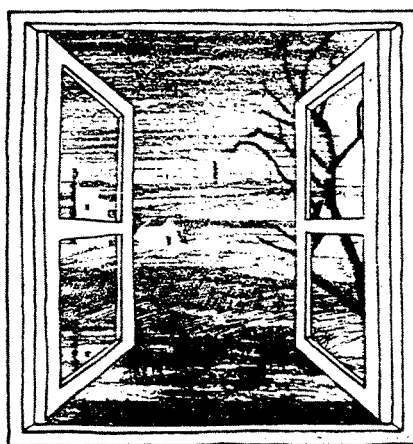
Here the editors have set the environmental problems in their social, political, economic and historical context; in fact the main theme is that our "modernisation", with no thought to the true costs, is the root of all our problems.

The second theme is the hand-in-glove collusion between industry, government and civil service to keep as much information as possible away from the public. Telling people what horrors are befalling them is "not in the public interest."

This comedy of errors is a damning indictment of successive governments and leaves you fuming. But it also gives you the ammunition to fight back, and ends on a sufficiently hopeful note to make you feel it is worthwhile. An excellent book. Miss it at your peril.

TONY WYLIE.

## GREEN BRITAIN OR INDUSTRIAL WASTELAND?



Edited by  
Edward Goldsmith & Nicholas Hildyard



# Little Black Rabbit

In keeping with our vigilance of party political activities, it must be mentioned that the Wick Branch of the Caithness and Sutherland Constituency Labour Party has shown yet again that they don't care much for Party policy.

Other Labour Party branches "deplore the action of the Wick Branch ... over the recent Trustee Savings Bank flotation." The Branch made £133.95 by selling 400 TSB shares which they received as priority applicants, being account holders at the Bank. The profit was described by the Branch Treasurer as "equivalent to a quite successful coffee morning."

Last year, the Constituency elected Alan Byron to be their candidate at the next election. Mr. Byron works at Dounreay and led the evidence for the Dounreay Action Group at the EDRP inquiry. Labour's national policy is against EDRP.

O O O O O O O O

The Social Democrats in Scotland are still trying hard to win the green vote, despite the national leadership's drift in favour of (British) nuclear power.

It has come to our attention that the Scottish SDP would like to organise a conference on the "environment", a laudable aim. However, such an event costs a lot of money, and requires considerable organisational skill and background knowledge. So they approached the people in the know.

But, do they really think that Friends of the Earth (Scotland) is able

to provide funding? Is it likely that a hard working, understaffed and underfinanced pressure group has more money than a political party? The SDP in Scotland seems to think so!

O O O O O O O O

We've all heard of Chicken Kiev, and Duck a l'Orange; well, what about Duck Kiev? A reliable source (!) informs us that five ducks were shot by a Dounreay staff member in December. One brace of the birds were reportedly so "hot" that they had to be disposed of in the low level waste pit.

Little Black Rabbit, despite having an obvious personal interest in such things, was unable to ascertain what species of fowl were involved. It is likely, however, that the ducks in question were sea ducks, and there is not an awful lot of sea in the Chernobyl area of the Ukraine! Is it possible that the birds became contaminated from somewhere much closer than Chernobyl?

In fairness, Dounreay management deny all knowledge of the ducks, and claim that they don't test such wildlife. If the story is apocryphal, and Dounreay does not test ducks, why not? Ducks are shot and eaten by many people in the Caithness area, and could be part of a pathway of exposure.

O O O O O O O O

The winter 1985 issue of the Wilson Quarterly (published in Boulder USA)

carried a long article which fully supported the future of nuclear technology. In the article mention was made of the 1947 American dream of building both nuclear powered submarines and aircraft.

As we all know the submarine project succeeded, but the aircraft idea flopped when the shielding needed to protect the aircrew from radiation proved too bulky for flight. In a last ditch attempt to solve the problem, the planners suggested that "shielding could be decreased if veteran pilots were used. They would die of old age before the radiation they absorbed became lethal."

Can we now expect to see the following BNFL recruiting adverts: "Wanted nuclear workers - must be over 65"?

O O O O O O O O

The civil engineering work has now finished at Torness, and McAlpine's travelling circus has moved on. Now that the construction workers have vacated the bed & breakfast establishments, cheap accommodation should be available again for local people and those few tourists who wish to spend their holidays 5 miles from Scotland's newest nuclear power station.

Not a bit of it! There are now fewer cheap rooms to be had in the Dunbar area than before the work began.

A reason for this may be the considerable accommodation allowance which the workers were given. Some local landlords hiked up their charges during construction to collect as much of the windfall as they could. Now the golden geese have flown the nest they have not reduced their charges to cater for the local homeless; they have closed up their gooseries, and some have even flown themselves with the proceeds. It's an ill wind ....

O O O O O O O O

Little Black Rabbit has received complaints about Police noting car registration numbers at the Torness rally last year.

The Chief Constable replied that he had not given the order, and it is probably true; but he hasn't told them not to either.

It is possible that they were simply keeping up to date the biggest computerised data base in the country.

Some time ago policemen used this data base to find the lucky car number competition, and told the owners: the prizes were a future nuclear industry competition!



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