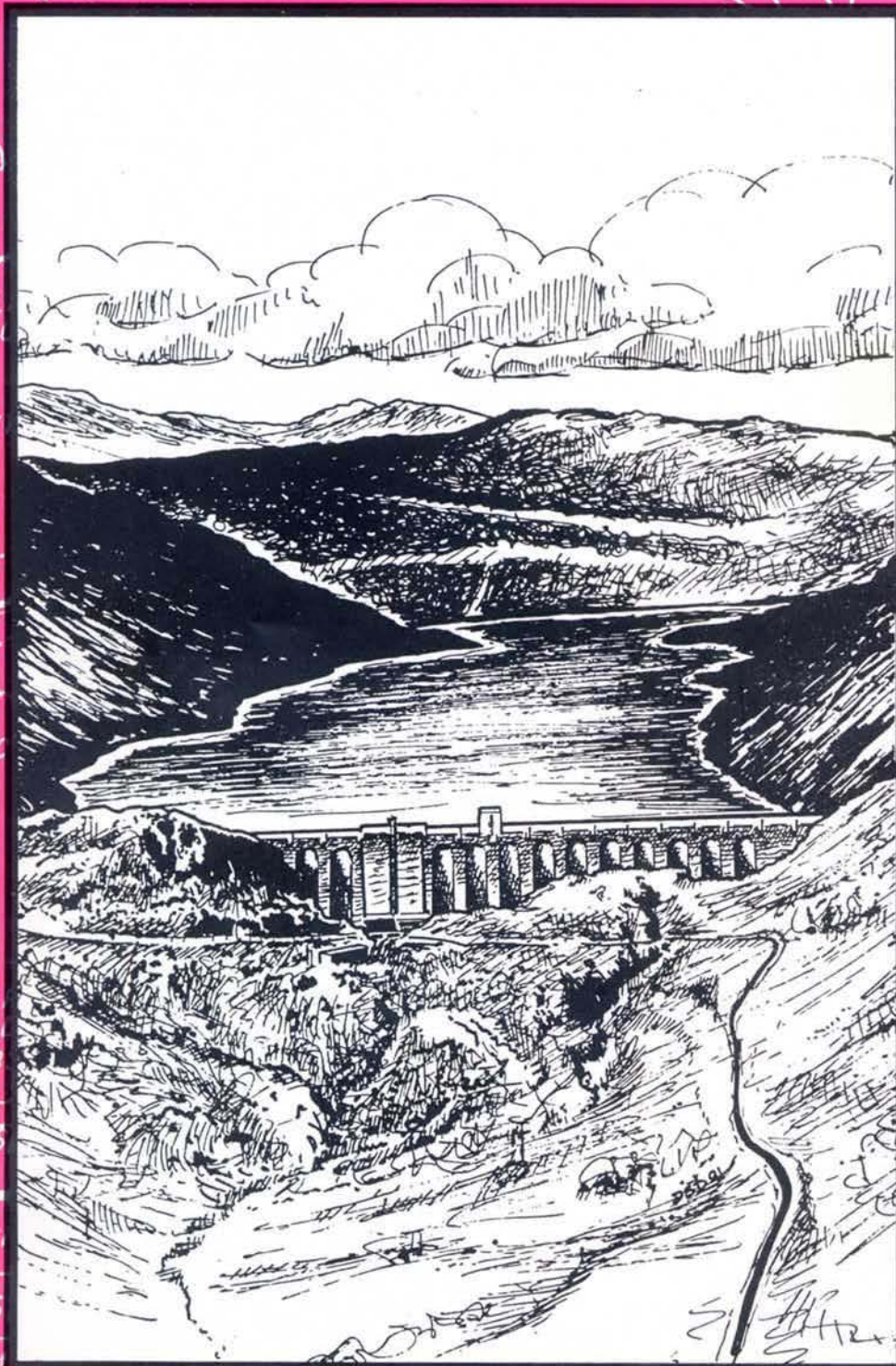


# SAFE ENERGY

No.86

December 1991/January 1992

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**UK flouts  
EC radhealth  
Directive**

**Danube dam  
damned**

**Harwell: an  
environmental  
disaster**

**Beyond  
the grid**

**Profits  
before safety**

**Hydro power  
politics**

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## COMMENT

**A**S we go to press, Dounreay has scored an 'own goal' in the debate over their bid to become a world centre for reprocessing highly enriched uranium (HEU) spent fuel from research reactors. They have lost 10kg of HEU.

Trying to pass their 'cock-up' of as an 'incident', plant manager Gerry Jordan was reluctant to speculate on the HEU's whereabouts. He told the press: "There is no evidence to suggest that it left the site, either through the effluent lines or in somebody's pocket." He continued: "At this stage, I can't discount any possibility." And continued: "Where the material is, whether it exists or not, or whether it is an error in accountancy or whatever, must be pure speculation at this stage."

The station's reprocessing plant was shut down at the beginning of December, after the AEA, under the supervision of European Community Inspectors, discovered the material was missing. The last comprehensive stocktake of Dounreay's nuclear inventory was in April this year, when no discrepancies were found.

Dr Wyn Lywellyn, a specialist in nuclear materials accountancy, has been flown up to Dounreay to head an investigation into the matter. It is expected that the plant will remain closed at least until his investigation is completed. Lywellyn is to report directly to the Department of Energy, his inquiry is expected to be completed by the end of the year.

Dounreay are obviously holding out for the loss to be a paper one only. Jordan claims that the accountancy process is not an exact science because of the complex measurements required. This begs the question, why carry out complex measurements if they don't give a reliable answer?

However, another possibility is that the HEU has been deposited somewhere within the reprocessing plant itself, either small amounts all over the place, or more worryingly all in one place. If it is all at one point within the system, then it goes a fair part of the way to forming a critical mass. This, presumably, is why they have taken the precaution of halting reprocessing activities, which could cost the AEA £125,000 a day.

At this moment news of Dounreay's at best stunning incompetence and at worst criminal negligence is ricocheting around the world. This latest fiasco must surely lead governments to concluded that sending HEU spent fuel to Dounreay hardly represents a sensible waste management policy.

**T**HERE remains, quite rightly, dissatisfaction throughout the renewable community. For sure, there have been some 'breaks' for renewable generation opportunities, but after more than a decade of stultification they are still paltry and the transformation is gained grudgingly at best.

We are still in something of a debilitating interlude. No prospective government can make positive moves with the uncertainty of limited power and funds.

For those with an active interest in renewables, there is a tendency, after so long in the wilderness, to adopt a wait and see attitude. Yet important issues have still to be addressed: should renewables be connected to national and international grids, or local networks with control of local people; how can we move to suppress the use of carbon-based fuels without adding suffering to the least well off; how can reconcile the demands of new technologies with the legitimate aspirations of other outdoor users?

To turn into the winds of change is a vital for survival, but to lack determination, is to be blown away in the gale. The renewable community must not shelter behind the obstacles but must get out there and use the elements to their advantage.

**A**NTI-NUCLEAR and renewable energy campaigning has never been more important. The renewable industry is looking up. The nuclear industry continues to lurch along its crazy, drunken path. New demands are constantly being made on SCRAM campaigners and great opportunities exist for interested activists.

Any interests in the range of nuclear and renewable issues can be fully developed with experience at SCRAM. You will also be making an essential contribution to environmentalism. If you want to develop research, journalism, campaigning or a range of skills, you should contact SCRAM now. Bring your own wages. LBR needs you!

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

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

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# SAFE ENERGY

## FEATURES

### 8 UK flouts EC radhealth Directive

The UK Government has failed to implement a European Community Directive, produced in the wake of the Chernobyl disaster, which calls for an extensive public information campaign on the possible consequences of radiological emergencies. Mike Townsley outlines the Directive, and reports on threatened legal action by the Nuclear Free Local Authorities.

### 10 Danube dam damned

While Hungary pulled out in 1989, Czechoslovakia continues amidst controversy with its Danube hydro-electric power scheme. Bridget Gubbins has been to the site of the dam, and finds environmental arguments being used by both sides in the dispute.

### 12 Harwell - an environmental disaster

Recent contamination of local water supplies is just one of the environmental problems facing the Harwell nuclear research establishment. Government Agencies, argues Paul Mobbs of Banbury Environmental Research Group, seem to be closing ranks, rather than openly dealing with the difficulties.

### 14 Beyond the grid

The role of small scale alternative energy systems, separate from the grid, is considered by Dave Preece. In the light of his own experiences building an energy efficient house, he indicates the benefits to the individual and society as a whole of a diverse, decentralised, sustainable energy policy.

### 16 Profits before safety

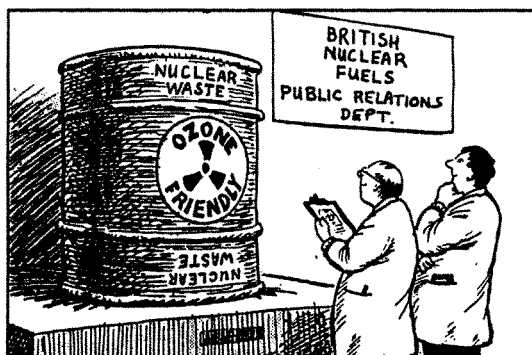
Direct discharge of untreated radioactive waste from British Nuclear Fuels' Springfields Works, into the River Ribble near Preston, is regarded by Government Agencies as the "best means practicable". Friends of the Earth's Radiation Monitoring Unit Co-ordinator, Nick Cassidy, summarises their findings and calls for an immediate cessation of Springfields' discharges.

### 18 Hydro power politics

In the first of two articles on Scottish hydro-electric power, Pat Agnew, Scottish Green Party speaker on energy, looks at the political and historical background which led to the development of the UK's only established renewable energy.

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This cartoon is taken from *When Humans Roamed the Earth*, a collection of Chris Madden cartoons which take a wry look at what we are doing to our planet and its other inhabitants.

Published by Earthscan in association with the World Wide Fund For Nature; 104pp, £6.99.

## Prometheus unfound

**J**APAN, the European Commission (EC), the US and the Soviet Union have all pledged £75 million towards designing a 1,000MW fusion reactor, the International Thermonuclear Experimental Reactor (ITER), based on the findings of the Joint European Torus (JET) project at Culham.

The funds cover a 6 year period and involve a commitment to establish a 200 strong central research team. While ensuring the short term future for fusion, there is as yet no commitment for the full £2.8 billion estimated costs of the entire project. Both the US and the Soviets have expressed doubts about future involvement. France have also blocked the release of further money from the EC.

Researchers hope to receive the extra funding to allow the construction of a commercial scale fusion reactor which, they say, would be ready for commissioning in 2004. However, while it will be commercial scale, by no stretch of the imagination could it be described as a commercial venture. It will be capable, they claim, of producing a peak of 1,000MW for periods up to 1 hour. Indeed, it has not yet been established that fusion can generate more power than it consumes.

Henry Seligman, deputy general of the International Atomic Energy Agency (IAEA) and architect of JET, believes that the Culham 'break through' announced just a few days before a crucial funding

meeting helped to secure the new money: "Culham certainly helped, but fusion experts already knew fusion would work, so they had no problem convincing their governments to put up the money. Even the Soviets came in without a murmur."

On November 9, deuterium and tritium gas were heated to around 200 million °C – some ten times hotter than the centre of the sun – in what has been described as JET's "historic breakthrough" in headlines around the world. This led to the reactor generating power for the first time. It produced a peak of 2MW in a pulse that lasted under 2 seconds. What was the cost of this momentous achievement? £1 billion pounds since 1983 and on the day a 700MW pulse of electricity to heat the deuterium and tritium.

### Unstable

This was also the first time a small amount of tritium had been introduced into the fusion equation. This, say the scientists, meant that it was difficult to maintain stable conditions within the reactor. Previously, they enthused, when only deuterium had been present it was possible to maintain stable conditions for as long as one minute.

In a genuinely commercial reactor, which will not be available until 2040 at the earliest, according to fusion scientists, the idea is for the gaseous deuterium/tritium mix to be 50:50. Around 700MW is then required to heat the gas until it forms a plasma. It is in the plasma state that atoms of hydrogen fuse, releasing vast amounts of energy, neutrons and helium.

However, this is not the end of the story, eventually the fusion plasma should become so hot that the reaction is self sustaining, the so-called ignition point. The temperatures attained are such that the plasma has an irritating tendency to "boil off" some of the materials from the containment vessel walls. Impurities then enter the plasma and shut down the reaction. In order to prevent this happening a 'pumped diverter' is being designed to alter the shape of the magnetic field currently used to control the plasma within the huge doughnut shaped reactor vessel. It should create a low temperature area, shielding sensitive areas of the vessel. This, according to US fusion pioneer Edward Teller, is like trying to confine jelly with rubber bands. Powering the magnetic fields will require about 5 times as much power as creating the plasma.

"We are working for the world. Fusion energy is not for one country or another. It is done for the world," JET director Paul-Henri Rebut. "It is impossible to tell if it will ever be economic, but if we don't do the work we shall not have the option."

In the extremely unlikely event fusion power ever becomes a reality, Guardian correspondent John Vidal hints at its usefulness on a global scale: "Fusion, the most expensive most inflexible form of energy ever contemplated, will almost certainly be a non-starter for most of Africa, South America and the East. Fusion offers nothing but the imposition of more western-led grandiose state-planning – the ill-thought out dream that reduced so many countries to the situation they are in today." □

## Japan's Pu Problem

**B**Y 2010 Japan's plutonium stockpile will have risen to over 100 tonnes, taking it to the top of the world "plutonium economy" league (*SCRAM* 79). At the International Conference on Plutonium, held in Omiya City at the beginning of November, delegates were told that the build up of plutonium was a threat to international disarmament.

Shipments from Cogema's La Hague UP3 reprocessing plant are due to begin next year from Cherbourg. They will be joined by plutonium from reprocessing contracts signed with Cogema of France, due to be shipped out from Cherbourg next year. Added to this, contracts signed with British Nuclear Fuel's Thermal Oxide Reprocessing Plant (THORP) will result in regular voyages from Barrow-in-Furness.

However, as yet the politics and logistics of transporting the plutonium to Japan remain to be worked out. Some Japanese and American officials have suggested that the plutonium may form

an irresistible target for terrorists. The question of whether or not the shipments can be adequately protected will soon be debated by the Bush Administration which has the right to veto the security plan. This is because the US supplied the original uranium to fuel Japanese reactors.

In a move intended to dispel international fears of a big expansion in plutonium use, the Japanese Atomic Energy Commission recently published a review of their 'recycling' policy which stressed a commitment to nuclear non-proliferation and established the principle that Japan should not possess more plutonium than was needed for fuel recycling.

They intend to use plutonium in fast-breeder reactors (FBR), a technology which remains unproven. The UK has abandoned its own programme, no decisions have been taken regarding the location or financing of the European Collaboration, Germany have closed their FBR before it even operated, France's breeder is less of a Super Phoenix more a dead duck, and Japan's FBR at Monju is broken. Japan is also

conducting experiments into blending plutonium with uranium to fuel conventional reactors.

Paul Leventhal, director of the Nuclear Control Institute based in Washington DC, said that even if Japan does not intend to build bombs, its policy will still encourage nuclear proliferation: with a surplus of plutonium and an advanced missile capability, Japan could make nuclear weapons in no time. Whether or not they intend to produce nuclear weapons, the mere potential to do so might encourage an arms race involving neighbouring Korea and Taiwan, he warned.

Paradoxically, over the last few months Japan has issued calls demanding stronger non-proliferation measures, including the abandonment of reprocessing facilities in North Korea, which are believed to be part of Pyongyang's suspected bomb programme. However, they are building their own reprocessing facilities at Tokai-mura, a move which can only aggravate the situation especially given the extremely low price of uranium on the world market. □

## From here to eternity

**P**RESSURE is mounting for British Nuclear Fuels (BNF) to spend £100 million on a control system to remove radioactive krypton-85 gas from the Thermal Oxide Reprocessing Plant's emissions.

BNF, who are due to apply for a licence to operate THORP in mid-December, have already spent £2 million to pave the way for fitting the system because they fear the Department of the Environment might bow to public protest over the issue.

Environmentalists fear that the massive amounts of krypton could alter weather patterns and result in an increased concentration of atmospheric water vapour, adding to the greenhouse effect.

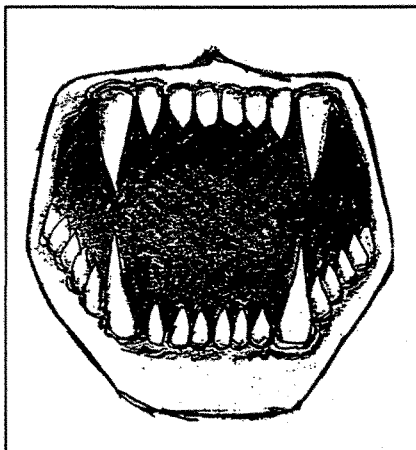
Physicist Rolland Kollert, who has produced a report on the environmental effects of radioactive krypton gas for the German government, told Granada TV's *World in Action* team: "It might reduce the fair electrical field ... reduction of the atmospheric electrical field increases the water vapour content of the atmosphere and consequently strengthens the greenhouse effect." He believes BNF's planned releases constitute a huge experiment with the atmosphere.

BNF are cautious, not wishing to further enrage environmentalists, but also not wishing to push the £2 billion plant further into the realms of economic lunacy, they have commissioned researchers at Liverpool University to

examine the subject. However, James Coote, of the BNF safety Team, argues that "you have to recognise that any industrial activity carries some risk. The risk from the environmental effects of krypton from THORP on the best evidence available are negligible."

14 years ago the THORP inquiry inspector concluded: "It is accepted by BNFL that krypton removal plant will be incorporated if the technology is available for its removal and safe retention is available ... I consider that BNFL should not merely stand by and install such a plant if and when others develop it. They should themselves devote efforts to develop it."

Coote contends that: "THORP is a very large plant ... you would need a very large scale clean up plant ... it is not possible to remove krypton at a commercial cost."



Greenpeace are giving the NII some teeth for Christmas! Cartoon teeth are also being faxed to the NII from December 16 (Fax. 071-2727 2254).

■ A radiation survey conducted by Bangor University's School of Ocean Studies for *World in Action* revealed that large parts of the west coast of Britain is contaminated with radionuclides from Sellafield.

Traces of both plutonium and caesium from Sellafield's reprocessing plant discharge pipe were found 300 miles away at a number of sites in North Uist. While it was previously accepted that the caesium could travel such distances, BNF claimed that the heavier plutonium would sink. "The caesium, which stays in solution has travelled a very long way. You can pick it up in the arctic ocean," said Dr David Assener of Bangor University.

Plutonium and caesium were also found in a number of other places, including: 25 miles up the Mersey; 7 miles up the Conwy; in Cardigan Bay; in the river Dee near Kirkcudbright, which yielded the second highest results; and, with the highest levels, the Ravensglass estuary. The Ravensglass estuary is the most radioactive in Britain, with levels of radioactivity 8 times those claimed in official figures.

North Uist local GP, John Macleod, who first highlighted the problem of caesium entering the island's food chain (*Safe Energy 85*), is calling for a full-scale Government investigation of the coast lines around the Irish Sea and beyond, from Cumbria to the tip of the Outer Hebrides, including the north and north-east of Ireland.

He said: "We need to know were else it has gone, and to let people know, to assess what chance there is of it getting into the food chain..." □

\* "From Here To Eternity". *World in Action* Granada TV. ITV 8.30pm 2/12/91.

## Computer chaos

**C**OMPUTERS at the heart of safety systems in Britain's nuclear facilities are to be the subject of a full-scale Nuclear Installations Inspectorate (NII) investigation, following an incident at the Sellafield reprocessing plant in which a computer error caused radiation safety doors to open accidentally in September.

While the NII originally passed the Sellafield software, it was later amended by British Nuclear Fuels (BNF), who operate the site. BNF did not think the alterations had any safety significance, and the NII are also now reviewing their bureaucratic procedures.

BNF said the company has completed an internal inquiry and will send the results to the NII, the plant is expected to reopen in mid-December. □

## No Accident coalition

**A** coalition of 11 anti-nuclear groups has been formed to push for the immediate closure of five of Nuclear Electric's (NE) aging Magnox reactors.

"No Accident" is demanding the closure of the power stations at Bradwell (Essex), Dungeness (Kent), Trawsfynydd (Gwynedd), Sizewell (Suffolk) and Hinkley Point (Somerset). Following the announcement that the NII has given NE until the end of the year to show that it can control the problem of increasingly brittle welds in the Magnox pressure vessels (*Safe Energy 85*), the group fears there is an imminent danger of a serious accident at any one of the stations.

"The reactors were originally designed to run for 20 years. Hinkley point A is now 26 years old. Nuclear Electric want to continue running the station until it is 35 years old. NE is desperate to keep the reactor working, despite these safety problems, to ensure its economic survival.

By doing so it is gambling with the safety of thousands of people by putting them at risk of a catastrophic nuclear accident," reads a leaflet produced by Greenpeace for the group.

■ Meanwhile Scottish Nuclear have put an end to the continued speculation about the future of Hunterston A Magnox station. It will close. An SN spokesman said the decision, following a 9 month review of the same decision taken by the plant's former owners, the South of Scotland Electricity Board, was taken on economic grounds. In short there is no market for its electricity. This avoids SN becoming embroiled in the safety fears over its English counter parts.

Paradoxically, SN's chair James Hann, has declared that Scotland will need two new nuclear stations over the next 15 years. They will be needed to replace the UK's aging reactor stock. A decision will have to be taken within 2 years of the Government's 1994 nuclear review because of long construction times: "The biggest obstacle we face is public perception of the industry which we are facing by being more open and frank." □



## Chernobyl shutdown

**C**HERNOBYL'S two remaining reactors will be shut down "in the shortest possible time and not later than 1993," say the Ukrainian Parliament.

"We are at least a year and a half late with this decision. The plant is the most dangerous nuclear site in the world," laments Yuri Shcherbak, The

Ukrainian Environment Minister.

Reactor two will be closed immediately, says the Ukrainian statement to the United Nations. It describes Chernobyl as a "world threat", pointing out that "The fire which occurred in 1991 caused a sharply negative reaction throughout the world community and put the issue of the immediate closure of Chernobyl on the agenda." (*Safe Energy* 85) Construction of the 5th and 6th reactors at the site has been abandoned.

The Ukrainian Supreme Soviet, admitting that it lacks both the technical expertise and financial resources to carry out the task, has asked the UN to help on both counts.

At the beginning of November the Union Ministry of Atomic Energy relinquished control of power stations in the Ukraine, leaving them with little expertise and no adequate watchdog. With 15 RBMK nuclear stations to cover, a new watchdog body is to be set up. □

## Torness transport

**A** train carrying the first flask of spent nuclear fuel from Torness nuclear power station was dispatched late in the evening on 2 November, under the cover of darkness - there was no announcement from Scottish Nuclear (SN).

Spent fuel flasks are now regularly leaving Torness bound for Sellafield's reprocessing plant, despite Scottish Nuclear's stated commitment to on-site dry storage, and two incidents involving radioactive contamination of identical flasks leaving Hunterston.

On 5 November radioactive water from one of Hunterston's cooling ponds was found on the surface of an A2 waste bound for Sellafield. In early October two spots of contamination were discovered on a fuel flask road transporter being prepared for Sellafield. Both incidents were given a zero-rating on the International Nuclear Events Scale.

While the incidents were minor, they exposed sloppiness in Scottish Nuclear's radiation management procedures, according to independent nuclear consultant John Large.

Public fears over the emergency services ability to cope with a serious accident involving a nuclear flask were further fuelled by an emergency exercise held in Edinburgh at the beginning of October.

At a simulated rail collision between a flask and a petroleum tanker, the emergency services failed to respond within the required guidelines set out by the International Atomic Energy Agency (IAEA). The IAEA require the flasks to be able to withstand a fire of 800°C for 30 minutes, it took the fire brigade one and a half hours to turn up. Dr John McKewon, SN's head of safety, admitted that petroleum can burn at temperature up to 1,400°C.

McKewon believes the flask "is so strong that it will not fail." However, he later added that "At worst there would be small leak of radioactivity ... but it is my belief that with all credible exercises, no radioactivity would come out." □



Decontamination shower at the SN exercise

## Dumping convention

**N**UCLEAR waste has been secretly dumped into the sea near Novaya Zemlya, north east of Murmansk, announced Andrei Zolotov, people's deputy to the USSR Supreme Soviet for Murmansk, at a press conference held to coincide with the first day of the annual meeting of the London Dumping Convention (LDC).

Despite being a party to the Convention's moratorium on sea dumping of nuclear materials, which was agreed in 1983, at least 11,000 containers of radioactive waste have been dispatched to "Davy Jones' Locker" over the last twenty years. Some of the containers, with both civil and military waste, had been hermetically sealed and refused to sink, so the Soviets drilled holes in them.

Zolotov also revealed that a reactor, which had not been defuelled, from the Lenin nuclear ice-breaker had also been dumped in the sea at a depth of between 40

and 50 meters. Remi Parmentier, Greenpeace's delegate to the meeting, called on the Soviet countries to give a clear undertaking that it had stopped nuclear dumping at sea: "The credibility of the dumping convention is at stake."

The Soviets apologised for their actions at the LDC meeting, where several countries are pushing for the moratorium to become a permanent ban. However, a number of other countries, principally the US are reluctant to take this step. They want to keep the option open, in particular because it presents a cheap and easy solution to the problem of decommissioning nuclear submarines.

A statement presented to the meeting by Iceland, Sweden, Norway, Finland and Denmark warns "There is growing concern among several nations that plans are being made to dump decommissioned or demolished nuclear weapons or naval vessels into the sea ... The disposal of these wastes should be carried out on land in order to secure total isolation from the biosphere." □

## Uranium market

**A**S the world recession in nuclear plant ordering continues to deepen the effects are being felt by the uranium mining industry. Energy Resources (ER) of Australia, who operate the Ranger mine in the Northern Territory are cutting back their operations.

126 of their 302 employees have now been made redundant because of the impact of low uranium prices. The company said they took the decision with "the greatest of reluctance following an exhaustive reevaluation of the options ... in the face of the steady deterioration of the uranium market."

Less than a handful of world uranium mines now operate at a profit. 'Yellowcake' (U<sub>3</sub>O<sub>8</sub>) prices on the world spot market have fallen to about US\$7.60 a lb compared with a peak of \$43.40 in 1978. ER's decision is the "unavoidable first step in a plan to reduce annual production to a level more closely aligned to forecast sales." □

## Nuclear's fresh start?

**T**HERE was plenty of talk, but not much hard evidence that the nuclear industry is about to turn a corner at the "Nuclear Power: A Fresh Start" conference, organised by IBC Technical Services and held in London in November, writes Crispin Aubrey.

Latest in a series of revival-style conferences, the talk this time came from about 200 representatives of the international nuclear community (95% male), including top managers from many of the major reactor manufacturers who hope to fill their production lines if the turnaround does happen. But there were no open cheque books or orders being taken, despite the upbeat tone of some of the speeches.

Nuclear Electric's John Collier led the assault, claiming that the Government's 1989 moratorium on nuclear construction was a "very helpful event in some ways", a spur to put their house in order. "We face a massive task to regain public confidence," he nonetheless admitted. Tempering the previous hype over NE's first full year's accounts (1990/91), he reminded the audience that half of NE's income came from the fossil fuel levy, while saying the £10 billion of liabilities inherited from the CEBG was a "very large millstone round our neck". His trio of prerequisites for "a fresh start" were firstly, better performance from existing reactors, secondly, completion of Sizewell B to time, and thirdly progress on the NIREX deep repository.

Collier also gave some insight to NE's approach to the promised 1994 review of nuclear power. The top priority (and lowest) risk would be to work on and improve the design of Sizewell B, he said, cutting construction cost and aiming for the 80% plant availability now claimed for 2 similar US PWRs. This design would be offered for at least the Hinkley and Sizewell C proposals. After that, it was a choice of

either using one of the more advanced overseas reactors (likely to require a public inquiry because it would be a "first of a kind"), or waiting for one of the new generation of reactors, which were likely to involve international cooperation and investment. "If we order a different design PWR, its likely to mean a substantial delay after 1994," he warned.

This order of priorities was confirmed by Brian George, in charge of the Sizewell project, who said later that NE was looking at a two stage process. "The first stage - if we can get away with it - is to build some Sizewell replicas. Then we can go for an international design."

Much of the event ran like a sales pitch for the new reactors which could fill NE's second and third options. Front-runners for the second option were Siemens' 'Convoy' and Framatome's 'N4' models, already under construction, followed by the American/Japanese 'Advanced' PWRs and the 'System 80+' being promoted in the US by Asea Brown Boveri (ABB). All claim to be 'advanced' versions of the PWR.

### Longer shots

The longer shots described by their promoters were the Westinghouse AP600, an example of the so-called 'passive' reactors which require little human intervention even in a crisis, and a Franco-German joint project through Nuclear Power International (NPI).

Predictably, most claimed something special over their rivals. ABB's Marketing Director, Richard Knapp, said their's was the only advanced PWR being considered by the US Nuclear Regulatory Commission for final approval. "We believe that the US may once again become the world's largest market place for nuclear plant."

A representative for Electricité de France spoke of stronger containment structures and a special pit underneath the reactor called a 'core catcher', while Mitsubishi offered shorter construction times.

Of the 'new generation' designs, NPI

claimed a 60-year life for its reactor pressure vessel and the ability to "load follow" by increasing or reducing power. Westinghouse, with the hardest sell of all, described its novel systems for literally flooding the reactor with water after an accident, rather than relying on multiple valves to be opened. "It will take a new type of design to revitalise the industry," according to the company's Bob Bruce. All the new designs place their main emphasis on prevention and/or mitigation of severe accidents.

One important theme ran through all these presentations, however. This was the problems that any new design is likely to face in getting a UK licence - clearly seen as one of the tougher regulatory nuts to crack. Most reactor manufacturers thought the strictures of the British system would increase their prices. The Nuclear Installations Inspectorate is already starting to examine the new French and German designs.

There was one other home truth underlying the proceedings. Although ABB reported orders for its designs in Korea, Siemens was looking to Finland, Framatome to Taiwan, there is very little activity around the world in terms of confirmed new orders. Brian George summed up the problem: "most of our energy over the next few years must be used to win the hearts and minds of the public."

Outside the conference hotel on the opening day, there was ample evidence of hearts to be won over. About 30 people from various anti-nuclear groups, including Shut Down Sizewell, demonstrated in front of a large banner cleverly mimicking the conference literature, reading 'Nuclear Power: A Dead End'. Two protesters also penetrated the proceedings momentarily to shout a slogan about Chernobyl. Conference chairman Sam Goddard of NE gave the protest a back handed compliment by saying that "the importance of the occasion has even got to our opponents." □

## Anti-dump network

**A**LL manner of individuals, groups and organisation share the common purpose of opposing Nirex's plans for a deep underground nuclear waste dump. To channel this collective opposition into an effective fighting force to challenge Nirex every step of the way, a new umbrella group has been formed, writes Martin Forwood.

A Steering Committee was recently set up - involving Cumbrians Against a Radioactive Environment, Cumbrians Against Radioactive Dumping, the Gosforth Action Group (acting for local villagers), Cumbrian friends of the Earth and Scotland Against Nuclear Dumping - to take on the initial role of formulating a strategy that will topple the Nirex proposal.

The Gosforth Action Group is seen as

an important ingredient of the new group, not only as their village is in the very front line of the Nirex attack, but also true local opposition is hard for the industry to resist. Indeed many of the members actually work at the Sellafield plant. Input from SAND is also vital, they have already successfully locked horns with Nirex at Dounreay. CARD fulfils the role as the vehicle which will carry the objections of those around the country who are not opposed to Sellafield's day-to-day activities but strongly object to the dump. FoE Cumbria have an active energy campaign and CORE continues with its 11 year campaign against reprocessing activities at Sellafield - the root cost of nuclear waste production.

Intended to be a 'behind the scenes' body, acting as an information gathering and dissemination centre in the first instance, the Steering Committee will

shortly be inviting other organisations to affiliate, thus securing the expertise and muscle of national groups such as Greenpeace and FoE who have already agreed to cooperate.

In the long-term it is intended that the committee will form the basis of a fully fledged group required to speak with one voice in opposition to the industry's dump plan at the Public Inquiry scheduled for 1993, or at the Special Inquiry Commission being called for by Cumbria County Council. □

Anyone wishing to donate towards the campaign, or requiring further information should contact:

Chris Sinton, Steering Committee Secretary, National Anti-Dump Network, 98 Church Street, Barrow-in-Furness, Cumbria LA14 2HT. Tel: 0229 833851, Fax 0229 812239.

Following the Chernobyl disaster, European Community government's, including the UK, agreed a Directive calling for an extensive public information campaign on the possible consequences of radiological emergencies. That Directive should have been built into UK legislation on November 28, two years after it was agreed in Brussels, it was not. MIKE TOWNSLEY reports on the Directive and threatened legal action by the Nuclear Free Local Authorities.

## UK flouts EC radhealth Directive

*"The Citizen's Charter is a testament of our belief in people's right to be informed ..."*  
John Major, Prime Minister.

**C**HERNOBYL clearly illustrated the chaos and confusion that can occur following a nuclear accident. In an attempt to pre-empt any repetition of widespread public panic, if such a disaster was to happen again, the European Commission has issued a Directive (89/618/Euratom) on "Informing the General Public about Health Protection Measures to be applied and Steps to be taken in the Event of a Radiological Emergency."

Due to have been transposed into UK law by November 28 of this year, it calls for "the population likely to be affected in the event of radiological emergency" to be given information about the health protection measures "applicable to it and about action it should take in the event of such an emergency." The Commission stresses that wherever possible prior information should be given.

It defines the "population likely to be affected" as any population group for "which Member States have drawn up intervention plans in the event of a radiological emergency." The UK has many such plans covering a wide number of different populations. Of particular note is the Department of Environment's National Response Plan for dealing with overseas nuclear accidents, which covers the entire population; it follows, that the entire population should receive certain information.

Itemised in Annex 1 of the Directive, this information must include:

- basic facts about radioactivity and its effects on human beings and on the environment;
- the various types of radiological emergency and their consequences for the general public and the environment;
- emergency measures envisaged to alert, protect and assist the general public in the event of a radiological emergency; and
- appropriate information on action to be taken by the general public in the event of radiological emergency.

A Commission briefing designed to aid member states in adopting the Directive advises that this information should be

primarily instructive and "aimed at reassuring the general public that emergency plans exist." It must be credible, and the "information for the population living near an installation should cover ... the unlikely possibility of an accident having any impact on the population." It should also specify the means used to "give alert."

In providing such information it will be difficult for governments to overcome the public distrust of official information. A survey carried out around the Berkeley nuclear power station in Gloucestershire found that 75% of the population would not follow official advice to shelter in the event of an accident but would evacuate immediately using their own transport. The survey also found that the basic facts about the nature of radioactivity and its effects were not well understood.

### Radiation protection

It is also important to give information on radiation protection, say the Commission, not just in relation to nuclear energy but "covering all radiation sources that may give rise to a radiological emergency."

They suggest that the public information should include:

- explanations of 'activity' and 'dose';
- the scientific units covered, with these quantities concepts (mention only Becquerels and Sieverts);
- a comparison between natural radioactivity and artificial radioactivity;
- explanations of the difference between irradiation and contamination;
- explanations of the difference between immediate effects and delayed effects; and
- description of pathways to man including transfer through food chain.

Article 2 of the Directive lists situations which could give rise to the "relevant level of danger" for which public information should be available. They include:

- an accident in the territory of a Member State involving facilities or activities which involve a significant release of radioactive material; or
- the detection, within or outside its own territory, of abnormal levels of

radioactivity which are likely to be detrimental to public health in that Member State.

The relevant level of danger is defined as "any situation likely to result in the general public receiving a dose during a period of one year following the accident of 5mSv." While this conforms to the current International Atomic Energy Agency recommendation, it is 10 times higher than that promoted by the UK's National Radiological Protection Board.

The Directive also highlights a number of nuclear activities for the attention of the information campaign:

- any nuclear reactor, wherever located;
- any other nuclear-fuel-cycle facility;
- any radioactive waste management facility;
- the transport and storage of nuclear fuels or radioactive wastes;
- the manufacture, use, storage, disposal and transport of radioisotopes for agriculture, industrial, medical and related scientific and research purposes; and
- the use of radioisotopes for power generation in space vehicles.

There is nothing in the Directive to suggest that it covers only the civil nuclear industry, indeed explicit references are made to "any nuclear reactor" and "any other nuclear fuel cycle facility." Therefore, argue the Nuclear Free Local Authorities (NFLA), it is reasonable "to conclude that submarine reactor accidents, aeroplane or surface or sub-surface ship accidents involving nuclear weapons, accidents at sites involved with nuclear weapons or components, are all covered by the Directive."

### Transport

When considering accidents involving the transport of nuclear material, be they civil or military, it would be reasonable to suggest that under the Directive everyone along the route should be informed of the possible dangers. However, the extent of nuclear materials transport throughout the UK is such that almost everyone is within range of being affected by an accident. Information on the dangers of transporting radioactive materials should therefore be supplied to every household.

However, the UK Health and Safety



Executive (HSE) rejects this last point claiming that convoys would not be affected because leaks were not expected to exceed 5mSv. The pat answer to which is, Chernobyl was not expected to explode, nor was Windscale expected to burn.

Although the Directive dictates that certain information should be provided it leaves the member government to decide how. The Commission does however offer instruction, arguing that any policy for providing information to the general public must ensure a high degree of cooperation between national regional and local authorities and plant operators. They also suggest that information could be provided as part of the curricula adopted in schools. The use of television, newspapers, exhibitions and public meetings is also promoted. The Directive also specifies the need for a permanent source of information.

Emergency planning criteria around nuclear installation is erratic according to a recent report from the Scottish Consumers Council (SCC). In a recent survey of public information provided by four Scottish stations - Dounreay, Torness, Hunterston and Chapelcross - they found that while Dounreay has a 3 mile emergency planning zone, at Torness the zone has a 3km radius. Information available in emergency procedure handbooks also varies and copies are not always available.

## Confusion

"An accident at any of these installations could affect many people living nearby. Their safety would largely depend on how well informed they were about what to do", says Deirdrie Hutton, chair of the SCC. The stations all provide information on emergency procedures to residents living nearby, however, the handbooks do not always contain enough information, and in some cases are difficult to read and badly laid out. When SCC volunteers were asked what they should take with them if they had to evacuate their homes, those who had read the Dounreay handbook said they would take clothes, medicines, valuables, and personal effects. Those with the Torness handbook gave highest priority to clothes and toiletries, whereas most of those with the Chapelcross book didn't know what to take.

The SCC are recommending that the books are redesigned, rewritten and updated at regular intervals. This call echoes that made by the Commission, which recommends updating the information "every two or three years" and "whenever major changes ... to intervention plans have a practical impact on the population ... [for

example] changes affecting the system of alert, the protection measures and the area covered by the intervention plan."

Current procedures in the UK for informing the public in the event of a nuclear accident were heavily criticised by Michael Barnes QC, the Inspector at the Hinkley Point C public inquiry: "Aspects of providing information to the public after an emergency ... seemed to be confused and unsatisfactory." Barnes was particularly worried about the lack of a planned response to public enquiries, pointing out that there was no organisation with specific responsibility and no pre-planned arrangements to publicise a telephone number and receive enquiries. The Directive offers the opportunity to rectify this situation.

In the event of an accident the population affected is to be informed without delay of:

- the facts of the emergency;
- the steps to be taken; and
- the appropriate health protection measures.

## Legal action

Given the UK's record of adhering to EC Directives it comes as no surprise that this one has not been enacted.

Indeed the HSE admitted that the necessary consultation document, which will form the basis of Britain's statutory response, was not yet ready. It is believed that the document will be focussing on three main issues: prior information to at-risk areas, information to local residents if an incident happens, and information to emergency staff. It is also believed that transport dangers have been rejected as "emotive" rather than "real", allowing them to back away from producing public information on the transports of Highly Enriched Uranium to Dounreay, for example.

"We haven't had enough time", is the official reason for Government failure. "Certain member states can just wait for translation of directives and then slam them directly onto the law books. Because we have a parliamentary system and look closely at the effects on various issues, and because we already have health and safety legislation it obviously takes longer," comes the full Government excuse.

This argument has been dismissed as "rubbish" by the Chair of the European Parliament Committee on the Environment, Ken Collins. "I can almost guarantee that the real reason is buck-passing between Departments", Collins added that "European Court action is possible."

Legal action is also being considered by the NFLAs, who believe that



Nuclear Free Local Authorities report

"Ministers at Energy, Environment, Health, Defence, Agriculture and the Home, Scottish and Welsh Offices are all flouting citizen's rights."

They have submitted a detailed complaint to Carlo Ripa de Mina, the EC Commissioner for Environment, Nuclear Safety and Civil protection, asking the EC to enforce the directive "for the benefit of UK citizens."

A number of member authorities are also considering taking legal action, "Particularly following last weeks EC court ruling that the UK can be sued in its own courts for damages for failing to implement agreed EC laws."

Will Herald, Vice-Chair of the NFLA National Steering Committee, said: "After the 1957 Windscale accident, Macmillan ordered: 'Nothing must be published without my seeing and approving it.' The failure to comply with this directive suggests not much has changed, and calls once more into question whether confidence can be placed in the nuclear weapons or nuclear energy industries, or Government."

For this reason the NFLAs have published the most detailed map currently available combining information on both military and civilian nuclear hazards including the air corridors believed to be used for the transport of nuclear weapons. □

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Both sides in the argument over the completion of the Czechoslovakian hydro-electric scheme, at Gabčicovo on the Danube, are claiming environmental credentials. BRIDGET GUBBINS\*, having visited the site, reports on the latest developments.

# Danube dam damned

**T**OP Czechoslovakian hydro-power engineer Miroslav Liska, of state-owned Hydroconsult, is annoyed and frustrated. The joint Czechoslovakian/Hungarian Treaty of 1979, to build a hydroelectric complex on the Danube, is having endless problems. The latest difficulty is the environmentalists, both from within Czechoslovakia and the neighbouring countries of Austria and Hungary.

Environmentalists are working with the local population to oppose the Slovak part of the scheme.

Liska has nurtured his project through three decades. Plans for the dams originated as long ago as 1958, with the first design being produced in 1969. When Hungary cancelled its part in the plan in 1989, for environmental and political reasons, the Czechoslovakian government decided to continue their part of the project.

Liska claims the project is green and economic: "The hydro-engineers are the original environmentalists. We called for hydro-electricity instead of coal-burning plants. There were many false calculations made in the economics of coal burning. Subsidies to coal-mining and the consequences to the environment were ignored. It is so dirty that in some places whole towns had to be evacuated. In Slovakia, if we complete the Gabčicovo dam, up to 30% of our electricity would be generated by clean hydro-power. There will also be benefits of flood control and improved navigation."

The area in question, 100km downstream from Bratislava, consists of a 60 km<sup>2</sup> storage lake, and a 17km channel leading to the hydro-electric dam at Gabčicovo. The Danube through most of its course is tame, throughout Germany and Austria it is dull and grey, flowing between concrete embankments. But here the Danube sparkles and dances between wooded islands. It is a wildlife haven.

Admitting there are environmental costs, Liska says: "Of course there were large construction works. We had to remove thousands of cubic metres of topsoil. But people want to live and have electricity, the clean energy of

hydro-power. We have to pay for this, to find a suitable compromise. It is a balance between what you lose and what you gain."

He complains bitterly about the attention-seeking environmentalists. "Dissidents chose this project as a tool to overthrow the regime in Hungary, it aroused feelings against the government. Now they are doing the same in Slovakia. I call them Green Totalitarians. They oppose the project to gain political power. They are not constructive."

Opposition groups present a diversity of views which contrast with Engineer Liska's. Among them are those committed to the principles of the Danube Charter, launched in 1990. The Charter aims to encourage a regional identity for the people of the Central Danube countries of Austria, Czechoslovakia and Hungary. Instead of the errors of the old Communist planning system and the Western economic system, it promotes a sustainable economy under local control, and the re-evaluation of development projects like the Gabčicovo dam.

## Nature Park

Austrian activists can be seen on demonstrations and blockades against Gabčicovo. Miroslav Liska objects to their interference. "Eighty per cent of the Danube in Austria is controlled by nine hydroelectric dams. They are happy to have theirs. Then they come here to preach to us to stop our only one."

But Katharina Nenxing of Vienna's Global 2000 group says: "We have protested against dams in Austria too, successfully at Hainburg, unsuccessfully at Freudenau dam this year. The Danube is international. We want to save what is left of its unique eco-system and form a three-nation Danube Nature Park."

Two years on from the fall of the Communist state, members of the Slovakian Green Party and the Slovakian Union of Nature and Landscape Protectors (SZOPK) are quickly developing the skills of environmental campaigning.

In July 1991 they decided to activate continuous protests against the commencement of a new phase of the hydro-project. Which involves the pumping of the water from the Danube to a new course into the 17km channel to the Gabčicovo dam. Changing the course of the river will dry out the 25km network of shallows and islands below this point. It will also divert the Danube into the territory of Slovakia, away from its present course as the border between Czechoslovakia and Hungary.

On the day when pumping was to begin, a march took place from Cilistov, near Sunorin, to the pumping barge at the point where the channel joins the Danube. Banners in Hungarian and Slovakian declare "NOBODY MUST STEAL OUR DANUBE" and "MEMORIAL OF STALINISM." World Wide Fund for Nature green panda banners were also prominent.

At the site, Klara Bencocova of EuroChain called for volunteers from the crowd to break through the police cordon guarding the barge. While she did so, in a well organised move a group of activists appeared from nearby bushes. Yelling, they charged along the pipes to the pumping barge, diverting the police's attention, and enabling those from the crowd to break through the police cordon and run to the barge as well. The crowd on the march, mainly people from nearby villages and towns, cheered jubilantly at their success.

After several hours of occupation, police vans arrived and the long procedure of removing the protesters began. Villagers who had cheered the occupiers shouted angrily whenever the police got rough. They don't like the police in their new democratic state to manhandle people.

All the occupiers of the barge were taken to the nearby police station for questioning. Twelve Austrians had their passports stamped, forbidding return to Czechoslovakia for two years.

Jaroslav Sibl, a lecturer in environmental science in Bratislava, was one of the barge occupiers: "Before the revolution in November 1989, it was forbidden to protest against Gabčicovo. It was considered a crime against the

state. Only a few of my friends did it." Laughing, he added: "Now some of them are MPs."

What does he want to see done with the mammoth 100km long construction of dikes, excavated storage lake and dam? "I am not so crazy as to ask for a complete restoration of the landscape. But we can adjust it. We can plant trees; a lot are growing already in the gravel where the topsoil has been removed. We can make lakes, use the area for recreation, fishing, in a semi-natural environment. As for the dam, its 1,500,000 cubic metres of concrete will have to stay as a monument to the stupidity of the past. But it only covers a small area, 56 hectares. Compared with other destroyed areas in Czechoslovakia, it is small."

On the navigation benefits, he says: "We either build larger boats, dig the Danube deeper and build locks. Or we accept natural limits, build smaller boats and have less traffic. In Western Europe, lots of traffic moves around without any acceptable sense. We don't want the same thing to happen here."

Regarding the benefits of hydro-electricity he says: "Electricity consumption is expected to increase by about 5% over the next 1 to 2 years. Gabčíkovo would take care of one year's expected increase in consumption. It's not worth it. Far better to improve our industries, so they use electricity more efficiently."

## EuroChain

Local residents on the northern shore of the Danube helplessly watched their beautiful water-woodlands being destroyed during the years of the Communist regime. Now their opposition is out in the open. Klara Bencocova, a lecturer in hotel economics, is a key organiser of EuroChain, a coordinating group of those opposed to Gabčíkovo. "We observed the Hungarian protesters in Danube Circle in the 1980s. I wanted the same thing to happen here. I spoke with friends and relatives, and we wrote letters to prominent people before the revolution. Now we organise continuous actions. We are demanding a full international study of the consequences of completing this dam."

Edyta Bauer is a Slovakian MP of the party Co-existence. She represents the local Hungarian minority in towns and villages on the north shore of the Danube, and participates in the actions: "We are worried by the rise of Slovakian nationalism. There are groups within the Slovak Parliament who feel their national pride is at stake if the dam is not finished. They blame the protests on the Hungarian minority. But everyone



who lives here is opposed, Slovaks as well as Hungarians."

Engineer Babej is the vice-mayor of the town of Samorin. He leads marches and speaks in public against the dam. He claims that construction workers stole so much material from the dikes that whole villages were built from it, and that it will not be safe to live nearby.

Liska disputes this: "These are ignorant claims. He does not realise that we checked the quality of the work done. This man as an electrical engineer is professionally zero. He is trying to make his career out of opposition to the dams."

Three villages are trapped between the existing course of the Danube and the channel into which it will be diverted. Agnes Hodeghety lives in Vojka-on-the-Danube: "It is like living in a prison. The children go to school in Samorin, a distance of 13 kilometres. When the channel is filled, we will be cut off. They will have to go to Gabčíkovo, cross the dam, and back to Samorin, a distance of 50 kilometres."

## Feeling of danger

Has there been any compensation for villagers? "Not a penny. There has been a lot of vague talk about cheaper electricity, and they started to build us a health centre. But even with compensation, it would not make up for what we have lost. We used to swim, and go fishing in small boats."

Worst of all is the feeling of danger. If, as according to plan, the channel is filled, it will be 1216 metres above the level of Vojka and other towns like Samorin. Agnes says: "We are used to living close to the Danube. When it floods, we know what to do. No matter how many independent studies are done, we will not be satisfied. We have no knowledge of

how the water would behave, flowing so high above the level of our village."

Engineer Liska is sceptical. "Existing dikes allow water to pass through, and at times have collapsed and there have been terrible floods. We have constructed the new dikes with impervious layers, and built underground walls. The villages are safer than before."

Clean, green electricity, or destruction of a unique water woodland eco-system? Irritating environmentalists with political ambitions or concerned campaigners for a sustainable future? In the new democratic Czechoslovakia, these arguments are typified in the struggle surrounding the Gabčíkovo issue.

Liska laments: "Now, just when we are ready to reap the fruits of the years of investment, environmentalists want to stop it. Since 1989, people use the freedoms to oppose things, sometimes against their interest."

Sibl argues: "There should be a re-evaluation of obsolete development projects like the Gabčíkovo dam. People must be consulted. Decisions should be suspended until there is agreement of all the inhabitants of the region." □

## For further information contact:

Hydroconsult, Radlinskeho 37, Bratislava, Czechoslovakia.  
Slovakian Green Party and EuroChain, Laurinska 1, 811 01 Bratislava. Activities against Gabčíkovo.  
SZOPK (Slovakian Union of Nature and Landscape Protectors) Gorkeho 6, 811 01 Bratislava. They organise summer workcamps on the Danube ecology.  
Global 2000, Hahngasse 15/14, Vienna 1090.

\* Bridget Gubbins is Publicity and Information Officer for the Druridge Bay Campaign, but is writing in a personal capacity.



Environmental problems at the Harwell nuclear research establishment are many and varied. PAUL MOBBS, of Banbury Environmental Research Group, argues for an open and comprehensive overhaul of procedures at the site.

# Harwell - an environmental disaster

**H**ARWELL'S problems have not stopped with the closure of its two materials testing reactors, Dido and Pluto, at the end of March last year (SCRAM 76). Recently, the contamination of the local water supply has become a major issue. The site also houses one of the largest collections of intermediate level nuclear waste in southern England, and there is also the question of decommissioning all the nuclear facilities on site - a problem as yet without a fully thought out solution.

In Banbury Environmental Research Group's (BERG) 1st report on safety at Harwell<sup>(1)</sup> it was stated that local geological conditions led to a strong possibility of ground water being polluted by material dumped on the site. In 1990, solvents were discovered in the drinking water of people living around the Harwell area. Their water source was a borehole three miles from the Harwell site. Later studies showed an underground plume of contamination extending out from the Harwell site towards this borehole.

During the early 1980s the British Geological Survey conducted extensive surveys of the area to determine its suitability to house a low-level waste dump. The local geology was found to be very complex, unpredictable, porous, and therefore unsuitable. This should have set alarm bells ringing, as Harwell already had two sites containing toxic chemicals - but nothing was done.

While a report on the initial studies into the extent and source of the contamination exists it is not available to the general public. The only information available is a report, compiled in association with the consultants employed to solve the problem - Dames and Moore International - for the Harwell Local Liaison Committee.<sup>(2)</sup>

Special plant is to be built above the waste sites. It will suck up the polluted groundwater, separate the solvents by blowing hot air through the water, and then filter the air given off. The groundwater pumped out will be run into the local sewer. Though a practical idea, the Report does not mention two significant facts. Firstly, low-level radioactive waste is buried alongside the dump sites, and this process will

mobilise as much radioactive material as chemical contaminants. Secondly, more than 3,000 gallons of water per day will be abstracted from beneath the Harwell site. As the local water table is already low through abstraction for drinking water, this could have significant effects on the local environment and agriculture.

In February 1989 it was announced that the PLUTO reactor would be shut down and decommissioned. This would allow Harwell to develop further its expertise in decommissioning, according to the press release. However, they have no practical experience in decommissioning reactors. The only such experience within the UKAEA is held by the Northern Research Laboratories who are decommissioning the Windscale Prototype AGR - a totally different type and scale of reactor.

## Redundant reactors

The Dounreay MTR, almost identical to the PLUTO reactor, has been shut down for many years, and thus some of the fission products within the core have decayed. Tackling this first would reduce the worker dose, and provide valuable information about decommissioning the more highly contaminated DIDO and PLUTO reactors. Under agreements made with the Department of Energy (DoEn), the UKAEA are required to undertake decommissioning in the most cost effective way, whilst minimising worker dose.

DIDO and PLUTO are not the only redundant reactors at Harwell. There have been many experimental reactors operating on the site since the late 1940s - some were very large. For instance, what has happened to the BEPO (5MW) and LIDO (200kW) reactors? Have they been properly decommissioned, or have they just been left to rot? Other parts of the plant, such as the fuel storage pond and the spent fuel handling facilities will also be highly contaminated. Parts of the site, even if decommissioned this year, will not be safe for dismantling and disposal well into the middle of the next century.

Before rushing into decommissioning the radioactive plant on the Harwell site, the UKAEA should create, for public consultation, detailed plans, in

association with the Nuclear Installations Inspectorate (NII), the National Radiological Protection Board, and the DoEn, to ensure the best possible programme.

Due to the lack of regulation over the years, waste management and disposal practices at Harwell have relied on patching together schemes which, it was hoped, would get rid of their wastes without causing contamination. This has clearly failed.

Harwell buried quantities of low-level waste on site. Later, and to the present day, they incinerated low-level wastes and sent the radioactive ash to Drigg. The incinerators at Harwell have operated for many years, yet it was not until last year that the Department of the Environment went through the process of authorising atmospheric discharges of radioactivity.

Radioactive effluent is regularly pumped into the Thames at Sutton Courtney. Despite the fact they have lost Crown Immunity, the consent and sampling data for the radioactive discharges to the Thames are still not publicly available. Downstream both AWE Aldermaston and AWE Burghfield discharge effluent into the Thames via the river Kennet. What are the cumulative effects?

## Pipeline leak

In 1961, the pipeline carrying effluent to the Thames sprung a leak and contaminated 100 cubic metres of soil. Yet it wasn't until 1990 that consideration was given to the radiological hazard this might present to the public. Harwell were always very dismissive of the significance of this contamination; it wasn't until BERG publicised the incident that the contaminated soil was removed. Even then it was dumped on the Harwell site. There was also a leak from the pipeline in 1988 which contaminated the surrounding soil at a nearby orchard. This leak is still being monitored.

Drums of intermediate-level waste have been stored at Harwell since 1983, the design and construction of which gave no thought to their retention capability when stored above ground. Repackaging these drums, say the AEA,

cannot be justified because of the dose which would be incurred by the workers. If the drums were soon to be sent to the NIREX repository, then this would be true. However, the International Atomic Energy Agency has criticised NIREX's repository design and proposed construction methods, so the completion date for the project may be put back many years. How much longer will these drums be stored at Harwell? The earliest guesstimate is until 2010.

Serious consideration should be given to immediately repackaging them all. Due to corrosion and seepage, many drums will have to be over-packaged - many already have. Surely it is more sensible to repackage a drum before it starts leaking, rather than after it starts leaking contaminating the surrounding area and the repackaging workforce.

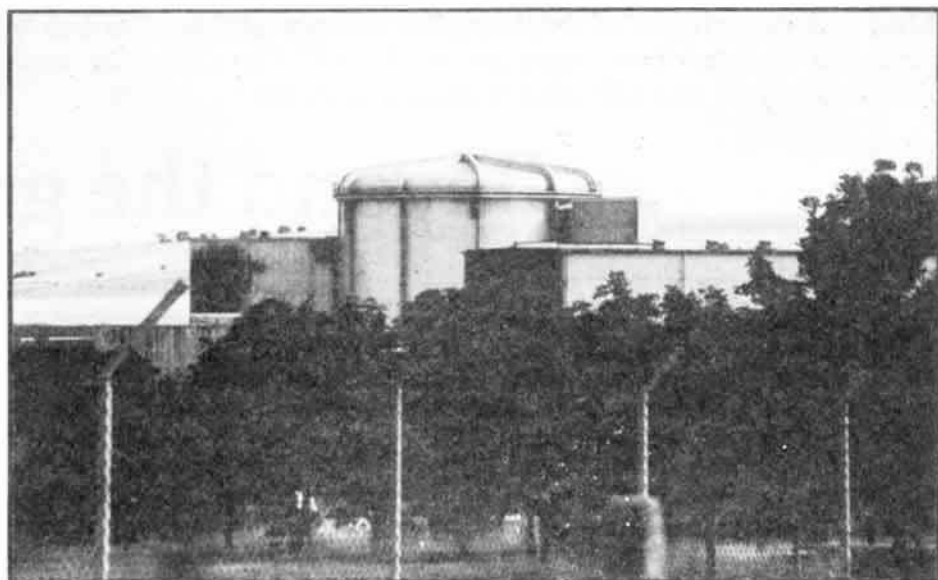
Decommissioning active plant will also add to the problems of waste. Only recently another building was constructed on site to take intermediate-level waste generated by the cleanup and initial decommissioning of the reactors. Rumour has it that this building will also take active wastes from AWE Aldermaston, as they have nowhere suitable to put it. This will further swell the already large collection of active waste on the site. There has been extensive opposition to the NIREX waste dump at Sellafield, but every time Harwell has applied to store more intermediate waste on site, there has not been a murmur from any of the major anti-nuclear organisations. Why?

### Leaking

Non-active wastes consist of many types of material - from old rope to toxic chemicals. From the late 1940's, when the site was briefly used by the RAF, up until 1977, a large proportion of the more 'difficult' wastes, such as toxic chemicals, were dumped in two areas of the Harwell site. It is this material which is currently making its way into the local water supply. From 1977 onwards, most of the wastes were packaged and moved to approved disposal sites. Unfortunately the local dump site which accepts special wastes is over the same groundwater aquifers, and is also leaking!

There needs to be a thorough review of the waste disposal practices, past and present, by the local waste disposal authority. Unless Harwell are open about how they handle their wastes, it will be impossible to ensure that other incidents do not happen.

The division of where military and civil safety standards apply at Harwell has never been made clear. It is hard to say



The DIDO materials testing reactor at Harwell

if all facilities are covered by civil regulations, or whether certain sections are run with military standards either part or all of the time. The use of the Harwell facilities by the MoD for the machining of plutonium must be scrutinised. As a civil organisation, the UKAEA are subject to IAEA/EURATOM, not MoD, standards. For example, it was revealed by the director of the UKAEA's Nuclear Materials Control Office that Harwell handles nuclear materials outside of safeguards. Why it is necessary for a civil establishment to take nuclear materials out of international safeguards, and what regulations it is kept under while these safeguards are suspended, is not clear.

Harwell does not have a plutonium smelting facility, therefore the plutonium must be transported to Harwell in its stable metal state, rather than as an oxide. This obviously presents twin problems of safety and security. Areas of responsibility should be made between the UKAEA and the MoD. This should stop the current confusion with the UKAEA hiding behind the MoD over certain areas of the site's work. It would also mean that strict standards could be set within the site, rather than the UKAEA switching between IAEA/EURATOM and MoD standards as they do at present. An inquiry must be held into the suspension of international standards governing nuclear materials at Harwell, and such instances should be forbidden from occurring in future.

It was recently announced that there would be a £40m refurbishment of Building 220, mainly dealing with extra air supplies and filtering, and new power supplies. This came shortly after the A90 complex at Aldermaston, which was to make the warheads for Britain's Trident missiles, was scrapped because of

building faults. Are the two events linked? The A1 building at Aldermaston, which made the Polaris warheads, does not have the capacity to make all 512 warheads by the time they will be required for service. Will Harwell conduct some of this work to make up the shortfall? It is a strong possibility as building 220 is the only other site in Southern England, and the nearest site to the bomb making plants at Aldermaston and Burghfield, capable of this work.

Information supplied by Harwell in response to a recent letter suggests they have many things to hide. A significant pointer to this would be the copy of minutes of the last Local Liaison Committee which were sent to BERG. Despite the fact that this is a public body, sections of the minutes had been crudely removed using scissors.

The AEA, the Nuclear Installations Inspectorate and the DoEn now seem to be closing ranks to prevent any further revelations on the safety of the Harwell site becoming public knowledge. Such information would not only damage the AEA - it would be severely embarrassing to the DoEn, and especially the NII. □

### References:

1. "The Safety of UKAEA Harwell and the Safety of the Harwell Materials Testing Reactors"; Paul Mobbs (BERG), Dec. 1989.
2. "Investigations into the Treatment of the Contamination of the Groundwater at Harwell Laboratory"; AEA Harwell, May 1991. Obtainable from Dr. A Fergusson, Head of Safety, AEA Harwell.

For further information contact Paul Mobbs, BERG, 3 Grosvenor Rd., Banbury, Oxon OX16 8HN. A new report - "AEA Harwell, Environmental and Nuclear Hazards", will be available from December, £4.00 inc. p&p.

After his experience of building an energy efficient house without professional assistance or previous construction experience, DAVE PREECE is now seeking greater use of easily understandable and affordable energy systems.

## Beyond the grid

**N**O one should now doubt, given the increase of electricity provision under the non-fossil fuel obligation (NFFO), that renewables are viable replacements for existing technologies. However, attention remains focussed on large scale renewables as a direct alternative to nuclear power and fossil fuel power stations feeding the national grid. All well and good, but this is only part of the story. Unlike fossil fuels and nuclear power, many renewables lend themselves to small scale application under local or individual control.

Wind, sun and water are widely available, to the extent that the most efficient use of these resources may depend on the development of small scale applications. Hopefully the future will see a diversification and decentralisation of energy, in many cases moving away from the all embracing grid, towards an integrated energy strategy based on small scale renewables. The aim, where possible, is to maximise the use of locally available resources to satisfy local need. The excess energy from such local schemes could be combined with power generation from large scale schemes, such as the existing Scottish hydro and the proposed Skye barrage via a much reduced grid, and used to provide energy for urban and industrial areas unable to supply their own needs.

Island communities have been successful in developing small scale power schemes, as on Foula. Why shouldn't such schemes be relevant to remote mainland communities? And there are always isolated properties where a stand alone power supply will be cheaper, and often more reliable, than a grid connection.

The necessary technology already exists. Large scale technologies are reasonably well catered for, if still criminally underfunded. Smaller schemes serving the grid are also becoming established, the commercial interest encouraged by the non-fossil fuel obligation in England and Wales

(if not yet in Scotland) ensures the future of this technology. The smallest, stand alone systems have yet to receive the attention they deserve.

Why have a stand alone system? The reasons are many: cost, reliability, moral objection to connection to a nuclear supplied grid, objections to electricity privatisation or to centralised control of energy.

A grid connection can be ridiculously expensive. A connection within 100 metres of an existing transformer can cost over £1000, and you will have to dig and backfill the trench yourself. If you agree to use more electricity you may get a cheaper connection. Perhaps this is commercially justifiable, but shouldn't our electricity suppliers have a commitment to energy conservation? In the north of Scotland where our cheapest electricity comes from mature hydro schemes, increased energy demand leads to greater reliance on more expensively generated electricity from elsewhere. In any case, it is not necessary to live far from a power line before the high cost of grid connection becomes excessive compared to the purchase cost of a stand alone system.

### Reliability

But, are stand alone systems reliable? Yes. Small hydro generators have been in use for many years. A thirty year old private plant near Inverness only ceased working recently (forcing grid connection) when a locally opposed new conifer plantation disrupted the water supply. Small hydro systems are well established, use existing technology and, as long as the necessary water supply can be guaranteed, are reliable.

Wind generators were in use for a long time (there is a pre-grid wind generator exhibited at the Laidhay Crofting Museum, Sutherland), before being pushed aside by the development of a national grid, but they had a reputation for being reliable. Fortunately, despite the lack of official interest and funding, technology moves on.

Although, you can now build or buy wind generators that demand almost constant maintenance and repair, most modern small wind turbines are effective, reliable and reasonably priced.

Reliability doesn't stop with the generating equipment. Unpredictable power surges and power outs, due to transmission faults, are a fact of life in rural areas even for those with a grid connection. Power surges are a particular concern since they may have an unpredictable, even damaging, effect on micro-processor control equipment which may be used with energy efficient heating systems.

The moral and political arguments against grid connection must speak for themselves. The arguments against electricity generation, centralised control, privatisation and so on are many and complex. The grid itself, however, in some form, is essential while we have cities and industrial regions.

Unfortunately, the decision to install a stand alone system is not free of bureaucracy. Local authority building regulations (at least in Scotland) tend to assume a grid connection, and some careful negotiation may be needed to obtain building consent with a stand alone system, although the further from the grid you are the easier this will be. For a single house, planning permission is unlikely to be a problem. Planning officers are usually helpful towards small projects if approached properly, but it is worth remembering that your neighbours have a say and the final word lies with a council committee. Building Societies and Banks may be a different matter. The valuer likes to see mains electricity available when you try to borrow money for a house. This will hopefully change as renewables become more established.

Most of the equipment necessary for a stand alone system is available from several companies who deal in a range of equipment, such as Wind and Sun, Low Energy Supply Systems and Island Energy. Dealing with one of



these companies has the advantage that you are able to obtain advice on a range of equipment from different manufacturers. However, you (or the company you buy from) will also have to match equipment, which may be from different manufacturers, to suit your system.


For small wind turbines, three companies names recur: Aerotron, Marlec Engineering and Proven Engineering. Of these, Marlec and Aerotron produce small turbines suitable for 12 and 24 volt battery charging which could provide basic low voltage lighting for a small house. While the Marlec and Aerotron generators may appear flimsy they have been well proven over a number of years, and offer a lightweight, easily installed option for low voltage electricity. Proven Engineering offer a stand alone package based around a solidly engineered 1kW aerogenerator which would provide all the electricity needs of a house, except for heating, at the normal 240 volts AC. Developed over nine years, the Proven wind turbine and associated control equipment has withstood the severest Scottish weather.

### Small hydro


Small scale hydro, despite the well established technology, is perhaps less attractive than a wind turbine because of the amount of preparatory work involved in ensuring an adequate water supply. However, those willing to tackle such an installation can look forward to an extremely reliable electricity supply. Island Energy can supply small scale hydro plant as well as a full range of other generating equipment.

But why limit ourselves to electricity generation? Diversification, whether or not connected to the grid, encourages the use of other energy sources and enables the matching of the grade or quality of energy to the service required. Heating is often the area where small scale electricity generation falls down. But why depend on electricity for heating when alternatives are available? Heating is exactly the area where solar energy and woody biomass come into their own.


Particularly in rural areas, large amounts of waste wood are left to rot. Cleared forestry, and wind thrown trees in particular are abandoned because of the economic cost of clearing the waste. Burning this resources for space heating and




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cooking could make a significant contribution to local energy needs, while producing considerably less methane than the same material left to decompose, reducing greenhouse gas emissions. It is foolish not to use this resource where it is available. Also, the work involved in cutting, splitting and drying encourages an awareness of energy conservation and energy efficient house design.

Perhaps you may even consider the possibilities of solar power, the easiest application of which must be to build a conservatory, or even a porch, on the south side of your house. Far more can, and should, be done with new housing design, but the simple conservatory can make a significant contribution to heating costs, possibly providing all the necessary space heating in the summer months. If summer space heating is provided by passive solar, why not consider solar water heating?

Several companies now offer solar water heating systems which should be effective anywhere in the UK, potentially providing all of your summer water heating needs and a significant winter contribution, for example in pre-heating water. Weatherwise Solar manufacture a basic flat plate collector (with a ten year guarantee) and supply kits for DIY installation. Rayotec offer the high-tec 'Thermomax' solar collector, again available as a DIY kit, and claiming significantly increased efficiency over flat plate collectors.

It is perhaps significant that to write about one form of sustainable energy without mentioning others is difficult. An energy policy based on local needs would, of necessity, encourage diversity in the technology applied.

To ignore the benefits of passive solar and woody biomass is simply to squander a continually renewable resource. Increased use of passive solar and increased insulation in all houses, town and country, would reduce the need for other energy inputs and produce tangible improvements in the quality of housing.

Increased use of small scale generating plant reduces the need for the extensive infrastructure of the grid. Conversely, decreased demand on the grid would allow necessary extra provision to be met by fewer large generating stations.

In short, the small stand alone system has an essential role in an energy strategy based on renewables. Not a replacement for the grid, or even a simple alternative to the grid, but a necessary and integral part of a diverse, decentralised and sustainable energy policy. □

#### For further information:

**WIND & SUN**, The Howe, Watlington, Oxford OX9 5EX

**LOW ENERGY SUPPLY SYSTEMS**, 84 Colston Street, Bristol BS1 5BB

**ISLAND ENERGY**, 1 Church Road, Erin, Isle of Man

**MARLEC ENGINEERING**, Unit K, Cavendish Courtyard, Swallow Road, Corby NN17 1D2

**AEROTRON**, Easter Achlea, Duneaves Road, Aberfeldy, Tayside PH15 2LS

**PROVEN ENGINEERING**, Moorfield Industrial Estate, Kilmarnock KA2 0BA

**WEATHERWISE SOLAR**, The Park, Forres IV36 0T2

**RAYOTEC**, London Road, Sunningdale SL5 0DJ

Discharges into the River Ribble, from the Springfields Works of British Nuclear Fuels, are causing concern. NICK CASSIDY, Friends of the Earth's Radiation Monitoring Unit Coordinator, reports on FoE data from the river, and calls for an immediate cessation of Springfields' discharges.

## Profits before safety

**B**RITISH Nuclear Fuels Springfields Works discharges untreated radioactive waste into the River Ribble in Lancashire, just 7 km downstream from Preston. During a recent survey, the Friends of the Earth (FoE) Radiation Monitoring Unit found high levels of contamination in the river, particularly in the Preston area, which have not been documented in the official monitoring programmes.

Nuclear fuels have been fabricated at Springfields since 1958, servicing both the UK defence and civil nuclear power programmes. In addition, some of the fuel products are exported.

The fuel fabrication process generates large quantities of liquid radioactive waste. Since 1978, Springfields has discharged more beta emitting radionuclides, excluding tritium, than any other UK nuclear site, except Sellafield. Since 1988, its beta discharges, excluding tritium, have been higher than from Sellafield.

Although other processes performed at the Works produce significant amounts of radioactive waste, the vast majority arises from the processing of imported uranium ore concentrate (UOC). The UOC contains a range of naturally occurring radioactive isotopes, however, only two (uranium-235 and uranium-238) are of value for nuclear fuel production. Most of the unwanted contaminants (mainly isotopes of thorium) are removed during milling operations performed at the mine, although the efficiency of removal depends on the level of impurity in the UOC in the first place and the purification process used, some processes being more efficient than others.

Any contaminants which remain in the UOC are removed during the fuel production process and discharged directly into the River Ribble. The effluent receives no treatment, other than recovery of some uranium and pH adjustment.

Since uranium-238 is the most abundant isotope in the UOC, its beta

emitting decay products dominate the waste stream. Thorium-234 (Th-234) has a half life of 24.1 days and decays into protactinium-234m (Pa-234m) with a half life of 1.18 minutes.

Other radionuclides present in the UOC waste stream are uranium-234 (U-234), uranium-235 (U-235), thorium-230 (Th-230) and thorium-232 (Th-232) and its daughters. All of these radionuclides have very long half lives and decay with the emission of alpha particles. Although discharged in lower quantities than the beta emitters mentioned above, alpha emitters may have very serious implications if inhaled or ingested.

### Discharge increase

During 1991, Springfields' liquid discharge authorisation was reviewed by Her Majesty's Inspectorate of Pollution (HMIP) and the Ministry of Agriculture, Fisheries and Food (MAFF). The new authorisation which came into effect on October 1 1991, specifies lower discharge limits for both alpha and beta emitting radionuclides than its predecessor but is unlikely to have any effect in restricting discharges. Quite the contrary, BNFL have predicted<sup>(1)</sup> there will be an increase in Springfields' discharges over the next five years resulting from increasing UOC throughput contracts (i.e. the amount of UOC to be processed).

Besides the new limits, a new and important clause has been included in the new authorisation requiring BNFL to use the best practicable means (BPM) to ensure that all discharges are kept to a level as low as reasonably achievable. It is no longer sufficient to ensure that discharges are merely kept below the authorised limit. However, the authorisation does not state what constitutes BPM and it is left to BNFL to make these decisions to the satisfaction of HMIP and MAFF.

BNFL has stated that it considers the best practicable means of reducing the radioactive waste discharge is for it to be made directly and untreated to the river. BNFL submitted justification

for this argument to MAFF and HMIP as part of the reauthorisation process, it also specified that the document should not be made available to the public.

The new authorisation which was issued by MAFF and HMIP permits BNFL to continue to operate this discharge policy thereby indicating MAFF's and HMIP's acceptance and approval of it.

This interpretation of BPM is made all the more absurd given that technology is readily available to reduce the radioactivity of the discharges, and is in fact already in use by the UK Atomic Energy Authority which has operated a laboratory on the Springfields site for some years.

The technology is simple. The short half life of Th-234 and Pa-234 merely requires that the effluent be stored in delay tanks for a period of months before discharge. If the tanks were sufficiently well shielded, radiation doses to operators could be kept to a minimum. Unfortunately, this procedure is unable to remove or decrease the levels of the long lived alpha emitting radionuclides, however, simple chemical treatment would render the contaminated material in the liquid effluent insoluble for it then to be removed by filtration. Furthermore, an alternative strategy exists for BNFL to significantly cut alpha emitter discharges without technology. BNFL have only to specify that its customers obtain UOC from low thorium sources for their fuel manufacturing contracts.

In spite of there being these simple and readily available options, BNFL has stated that it cannot afford discharge reduction technologies: "... even the most economical of the available [effluent reduction] alternatives, would lead to an incremental cost that would effectively price BNFL out of the market"<sup>(2)</sup>. It is to be noted that BNFL is presently investing £145m on new fuel fabrication plant on the Springfields site due to come on stream in 1994/95.

Besides MAFF's role as joint authorising department along with HMIP, it is also

responsible for the official monitoring of the environmental distribution of discharges from nuclear sites and assessment of pathways back to humans. Official monitoring of the River Ribble has been notable by its absence. Although discharges from the plant began in 1949, MAFF's sole monitoring site in Preston (at Penwortham Bridge to the east of Preston) some 5km upstream of the outfall, was only included in 1987. Thereafter, MAFF has found this site to have the highest levels of Springfields derived contamination it has on record.

Historically, MAFF has concentrated its (limited) monitoring efforts on the section of the river downstream of the outfall. Presently, MAFF's monitoring programme only covers five locations on the Ribble, the Penwortham Sea Cadet hut site still its sole monitoring location upstream. In 1989, BNFL also published, for the first time, details of contamination up to the Penwortham Bridge area.

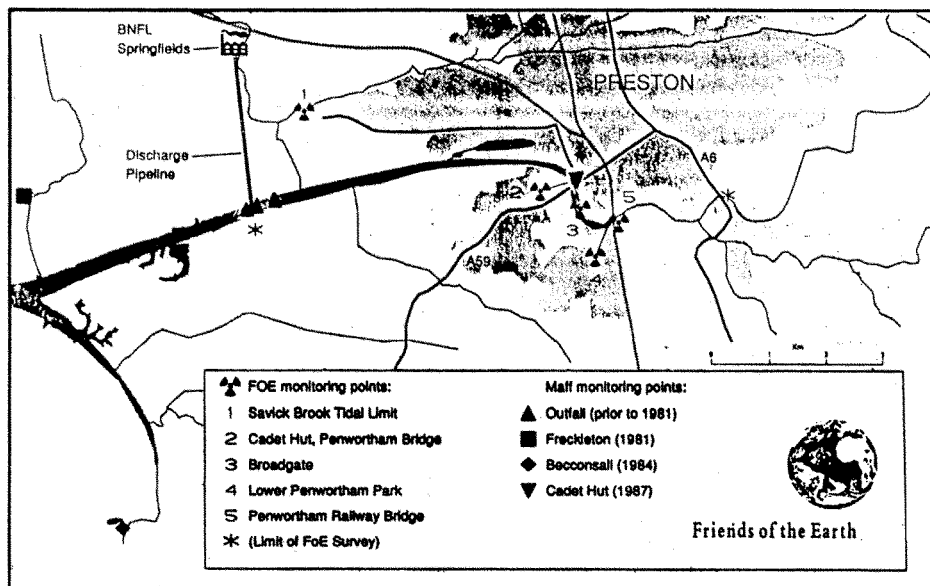
In May 1991, Friends of the Earth (FoE) began a radiation monitoring survey of the River Ribble, upstream of the outfall. The survey is still in progress although we present some of our preliminary findings here.

### Higher figures

The FoE data for sediment contamination and dose-rate are higher than has ever been published by either MAFF or BNFL, for the section of the Ribble passing through Preston. Furthermore, the FoE survey found contamination extending some 2.5km further upstream than MAFF's monitoring programme.

The average level of Th-234 contamination from all 17 FoE sample sites was 1,091,258Bq/kg with a range from 66,412 Bq/kg to 2,266,300Bq/kg. Since Pa-234m is in equilibrium with Th-234, there will be similar levels of Pa-234m in the sediments. These levels of contamination were reflected by similarly elevated environmental dose rates ranging from 0.11 $\mu$ Gy/hr to 0.55 $\mu$ Gy/hr. To put these figures into perspective, Pa-234m levels measured by MAFF at the Penwortham Sea Cadet hut (MAFF's sole monitoring point in Preston) averaged 217,000Bq/kg over the years 1987-1989. Similarly, the mean dose rate at this location and for these years as measured by MAFF was less than 0.14 $\mu$ Gy/hr. More recent figures are not available.

The levels of contamination found by FoE, although not averaged over a



**BNFL Springfields contamination of the River Ribble**

year, cannot be considered unusual. Beta discharge levels peaked in 1983, it is likely that levels of contamination in the sediments of the Ribble would have reflected this.

Most notably, the highest levels of contamination and dose rate were found in and over river sediments as the river flows through Preston, most of which is not monitored by either MAFF or BNFL. One such site, adjacent to the Lower Penwortham Park area of Preston is a popular recreational spot, particularly with children who play on the dry riverbed during the summer months.

It is highly likely that the sediment samples collected by FoE will also be contaminated with high levels of alpha emitting radionuclides. These pose a particular hazard if ingested or inhaled such as may be the case at Lower Penwortham Park and other urban areas adjacent to the river. Analyses for these are underway presently, results will be presented in a full report to be published in 1992.

Previous habit surveys performed by MAFF have indicated that boat dwellers living on boats moored over the mud in the lower Ribble Estuary form the critical group for external exposure from both the Sellafield and Springfields discharges. However, MAFF do not monitor at Lower Penwortham Park and several of the other contaminated areas in Preston identified by the FoE survey, furthermore, none of the habit surveys have documented the occupancy times of children or adults who spend time near the contaminated sediments of the Ribble in these areas. Using assumptions and estimates of

occupancy times, BNFL has stated that the maximum dose received by a member of the public, aside from the boat dwellers is 9 $\mu$ Sv/annum. Putting FoE data into a computer model developed by MAFF, this dose would be reached, from external exposure alone, in less than nine minutes per day over a year spent over the mud at Lower Penwortham Park. Even if the contamination levels averaged only a third of those found by FoE, this level of exposure would be reached in less than half an hour per day. A child would need to spend just 81 minutes per day over a year to receive a radiation dose of 100  $\mu$ Sv/annum (again neglecting the contribution from internal exposure).

It can only be assumed therefore, that MAFF have not accounted for the exposure of these people, who may therefore form the real critical group. The importance of identifying the correct critical group for any nuclear site is only too clear. In this instance, the new authorised limits have been calculated on the basis of exposure of the boat dwellers. In view of the fact that BNFL has announced its intention to increase the levels of discharge in the near future, there is a particularly urgent need for MAFF and HMIP to take immediate action to ensure that operations at Springfields cease until such time as a rigorous habit survey is performed by MAFF; the river monitoring programme is expanded to fully include Preston; and finally, that Springfields employ the best practicable means to reduce its discharges. □

### Reference:

1. BNFL's unclassified Submission to the Review of Springfields' Liquid Discharge Authorisation. (January 1991).



During World War 2, Tom Johnston struck a political deal with Churchill which led to the formation of the Hydro Board, establishing hydro as the first fully fledged renewable. Here, PAT AGNEW, Scottish Green Party speaker on energy, highlights the major political landmarks in its history.

## Hydro power politics

**V**ARIOUS types of water turbine were developed in the 19th century, but they found little application until the arrival of reliable electricity generators and electrical equipment.

Around 1880 electric motors and generators of reasonable efficiency made it possible to transmit power over short distances for such things as cranes and the primitive electric trains of the age. At the same time electric light bulbs were developed simultaneously by Edison in the USA and by Joseph Swan in Newcastle. (In Britain, Edison and Swan combined their interests: older readers may remember seeing "Ediswan" bulbs and other products.)

A lot of small hydro plants for country houses and private estates were built between 1880 and 1939. Many of them might now be considered very inefficient, but efficiency was not what they were built for, they were built to provide services, particularly light, that would not otherwise have been available. In 1880 the gas mantle had not yet appeared: gas lighting was by open gas jets, the alternatives were oil lamps or candles.

The electricity supply industry grew up as a lot of separate undertakings; some private others municipal. Each had its own technical characteristics: d.c or a.c.; single-phase, two-phase or three phase; with frequencies varying from 25 to 83Hz; and just about every possible voltage between 48 and 500. Not even light bulbs could be standardised. Everything tended to be expensive: electricity was a luxury item, for the rich - the poor stuck to their gas lights. Britain was behind other industrial countries in the use of electricity. Attempts to persuade the various undertakings to voluntarily standardise and amalgamate their systems failed.

In January 1925 a committee, under the chairmanship of Lord Weir - a prominent Glasgow industrialist who had been Secretary of State for Air in 1918 - was appointed to examine electricity supply. Working with remarkable speed, their report, dated 14 May 1925, showed that electricity consumption in Great Britain was 110 units per head per annum as compared to 1200 units in California, 900 in

Canada, 500 in the USA as a whole, 500 in Norway, and 145 in Shanghai.

Weir found that there were too many small inefficient power stations, the larger stations had a much better efficiency. In total the power stations had spare plant for 68% of the maximum load, which was considered excessive: but this figure could not be reduced without interconnecting the various systems, requiring their technical characteristics to be standardised.

Weir produced an overwhelming case for standardisation, interconnection, the concentration of generation in large efficient power stations, and for going out to sell more electricity. These guidelines have been used by the electricity supply industry from that day to this.

The Committee recommended the building of a 'grid-iron' of high voltage transmission lines. Authorised power stations would sell their power to Electricity Commissioners, who would sell it on to the local distributors (who were sometimes also the owners of the power stations). Inefficient power stations would be closed down. It was anticipated that the grid would take 15 years to build, and would cost £250 million - a vast sum in 1925. It was to be financed by the issue of what was,

in effect, Government stock: in other words the grid was to be a nationalised institution. Weir was a loyal supporter of the Conservative Party: the Electricity (Supply) Act, 1926, which embodied the proposals of his committee, was passed into law by a Conservative Government.

### Building Programme

In 1940 the Clyde still had the world's greatest single concentration of shipyards, and Churchill needed the co-operation of the shipyard and munition workers of the 'Red Clyde' for the war effort. He decided to put in a left-winger as Secretary of State for Scotland - the man he chose was Tom Johnston. As a young journalist before the 1st World War Johnston had written a book about Scottish Landlords, he had enormous difficulty in getting it published and when it was a lot of copies were destroyed, it is now very rare and of great value to book collectors.

Churchill promised support in Parliament and a limited amount of money for some of Tom Johnston's pet schemes in return for his support in the Clyde. One of those projects was hydro power. There was very little trouble on Clydeside - certainly much less than in the First World War - and in 1943 Johnston got his reward, in the form of



Loch Sloy dam: buttresses under construction

Source: The Hydro

an Act establishing the North of Scotland Hydro-Electric Board (the Hydro Board).

The Board, a nationalised concern, was largely modelled on the US's Tennessee Valley Authority. The Tennessee scheme – part of Roosevelt's 'New Deal' – was a huge rural development incorporating a number of hydro plants, in a backward part of the Southern USA.

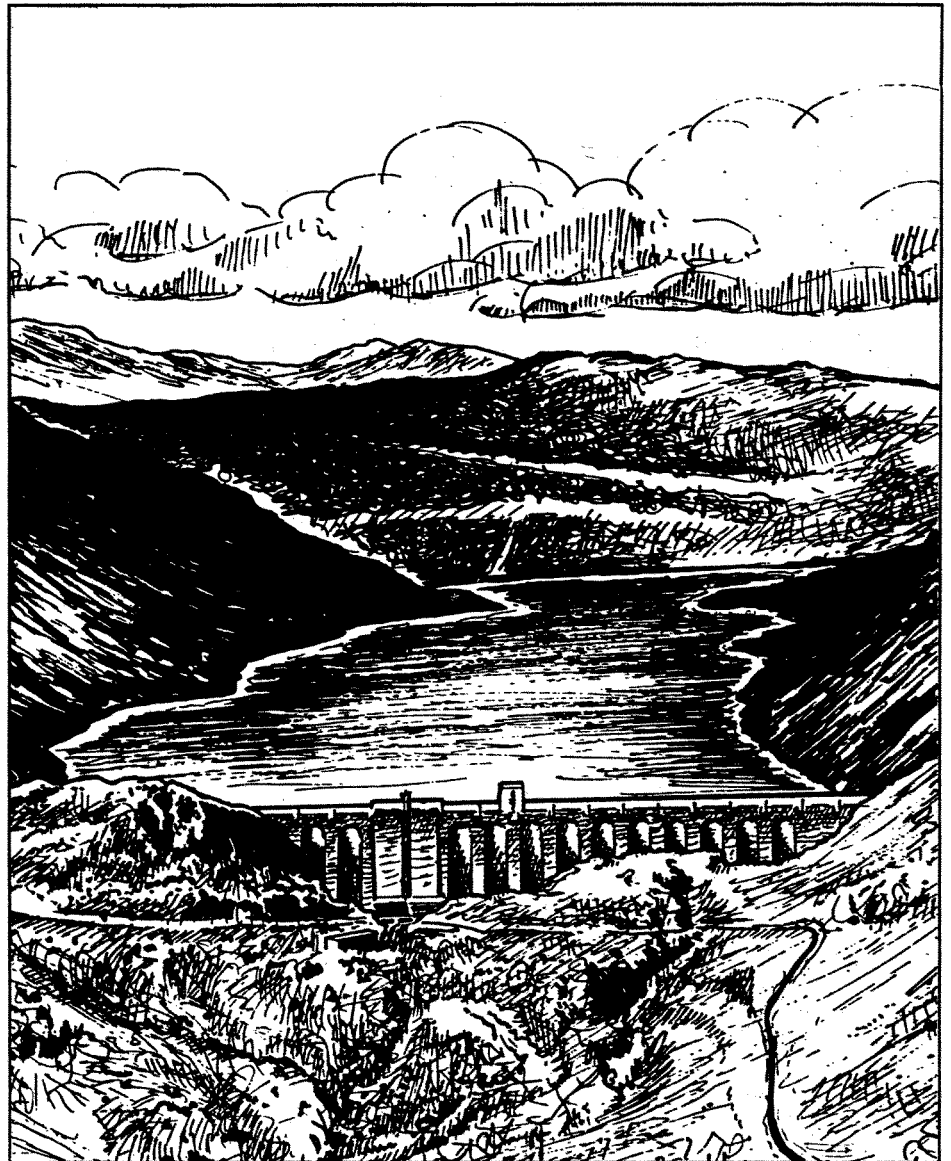
The Scottish Hydro Board Act contained the famous Social Clause: "The Board shall collaborate with any measure for the economic development or social improvement of the north of Scotland ...". The wording is important, meaning that anyone with such a measure could put it before the Board, who were bound to collaborate. The clear intention was that any profits should be used for the North of Scotland Region as defined in the Act: this was confined to the rural areas of the Highlands and Islands. Hydro plants may be very profitable in the long term, but they bring no quick profits, so this clause was not likely to be of much use in the early years.

It is impossible to believe that this Act of Parliament would have got through the House of Lords without Churchill's support.

### Amenity issue

In 1944-5 there appears to have been nobody seriously prepared to object on amenity grounds to the building of a power station at Sloy, but there was considerable opposition to the proposals for the Tummel-Garry scheme. The objectors were led by Perthshire County Council and the National Trust for Scotland. The public enquiry took place in 1945, in the closing weeks of the war in Europe. The report runs to 1,188 foolscap pages. It is difficult, now, to see what all the fuss was about: the tourists who admire the Queen's View from Victoria's favourite view point are not aware of the fact that the level of Loch Tummel has been raised; Loch Faskally is not the environmental disaster that was predicted, but rather an enhancement of the landscape; even the dam at Pitlochry, which is by no means beautiful, attracts large numbers of visitors – despite the fact that the present owners charge them for the privilege of seeing the display inside the power station.

In 1945, local feeling ran high. The Board's engineers were refused accommodation at all the hotels in Pitlochry except for one, and the fact that it was owned by an Irishman did not help local relations. Lord Airrie, the



chairman of the Board, was ostracised by his peers as a traitor to his class.

In 1946, Tom Johnston retired from his cabinet post and took on the chairmanship of the Hydro Board as a part time job. It is reputed that in his desperate need to find accommodation for construction workers he actually stole the buildings of an unoccupied army camp.

To understand the problems that he had, it is necessary to understand the economic state of Britain in 1945. By the end of the war 11 million tons of British shipping were lying at the bottom of the sea and normal trade had come to a stop. A greater proportion of Britain's workers had been devoted to the 'war effort' than in any other country. There had been no new houses built for 6 years: the shells of houses uncompleted in 1939 could be seen standing on the outskirts of most of our towns. The bombing had simply added to the housing shortage. A building licence was needed to build anything at all, and you had to be in desperate need to get one. The end of the war did not end the

problems; instead we were suddenly faced with the responsibility for feeding a substantial part of Germany. For the first two years after the war British rations went down, not up.

The electricity supply system was feeling the strain, like everything else. There had been no new equipment and only the minimum of maintenance for 6 years, but during that time consumption had increased, and coal production had not been keeping up with demand. By the end of 1946 coal stocks were dangerously low.

January to March 1947 was the coldest winter of the century. It was particularly bad in the South of England. Coal trains were snowed up; ships with coal for London were storm bound in the Tyne for weeks on end; power stations ran out of coal. The government resorted to increasingly desperate measures: it was made illegal to use electricity for domestic purposes between 8.30 and 11.30am and between 1.30 and 3.30pm, and in many places if the electricity came on at all outside those hours it was at reduced voltage.

Most industries closed down completely. Street lights were turned off, shop windows went dark, television was cut off. The thaw in March caused devastating floods. Things returned more or less to normal in April, but it was made illegal to use electric space heaters until the 1st of October, under pain of a £100 fine or three months imprisonment.

Tom Johnston saw his chance. As an elder statesman of the governing Labour Party, on close terms with most of the cabinet, he must have found it relatively easy to convince them of the need for hydro power. He obtained promises of increased supplies of money and materials not only for Sloy and Tummel-Garry but also for a number of other schemes. Overnight the Hydro Board had acquired a programme of work for several years to come and the resources to carry it out.

### Arbitrary division

There is a story that in 1946 or '47 Tom Johnston and 'Mannie' Shinwell – two former left-wing rebels, the latter the minister for Fuel and Power – went for a walk along the river bank at Pitlochry to decide the future organisation of electricity supply in Scotland. There had been a rumour that the Hydro Board might be abolished, or at least stripped of its function of local distribution. Instead of that, they decided to increase its size, by making it responsible for distribution in an enlarged area, which included the towns of Inverness, Perth, Dundee and Aberdeen. This decision was written into the 1948 Act that nationalised the whole of the electricity supply industry. It divided Scotland along an arbitrary line that separated Dundee from St. Andrews and Stirling from Dunblane. It made little sense in 1948 and it makes no sense at all now. It ensured that from that time onwards, the majority of the Hydro Board's customers would be town dwellers. This diverted the attention and the resources of the Board from its original purpose: they carried out a major programme of rural electrification but they never were able to make significant use of the Social Clause for anything else.

In 1954 the Scottish Office took over responsibility for electricity supply in Scotland. The whole British grid had been run by the Ministry down in London; the Scottish Office, in taking control of the Scottish end, combined the South West Scotland and South East Scotland Electricity Boards together with the part of the grid in the South of Scotland to make the South of Scotland Electricity Board (SSEB). This was bound to lead to trouble: the Hydro Board instead of selling power to the

grid, now had to sell it to the SSEB, and from the start the SSEB, with most of the customers and therefore most of the money, had ambitions to absorb the Hydro Board. Before long there was a dispute between the Boards about the purchase of power by the SSEB when the Hydro Board had a surplus.

Tom Johnston resigned from the chairmanship in 1959 and died in 1960.

The debate about the future of hydro-power began in 1961. By this date the memory of 1947 was fading, and though nobody liked to admit it, our energy problems had been solved for the time being by imports of cheap Middle Eastern oil.

An economist at Aberdeen University argued that, "the advent of atomic energy suggested that in 50 years time hydro-electric stations ... may be as obsolete as the horse and carriage". The Conservative Scottish Power Investigation Committee argued that thermal stations, fuelled by Lanarkshire coal, would be cheaper, less environmentally harmful, and more reliable in times of drought than hydro schemes – this looks very much like the Auld Alliance of miners and land owners. The last coal mine in Lanarkshire shut long ago, and hydro power now costs less than a quarter of the price of power from coal fired power stations.

The Departmental Committee on Electricity in Scotland (the Mackenzie Committee) was appointed by the Secretary of State in March 1961. One of its tasks was to make a comparative analysis of hydro power with other sources, commenting on their availability and costs. The Hydro Board's accountants put forward their figures, the SSEB's accountants theirs. The Committee never really managed to reconcile them. The main problem is

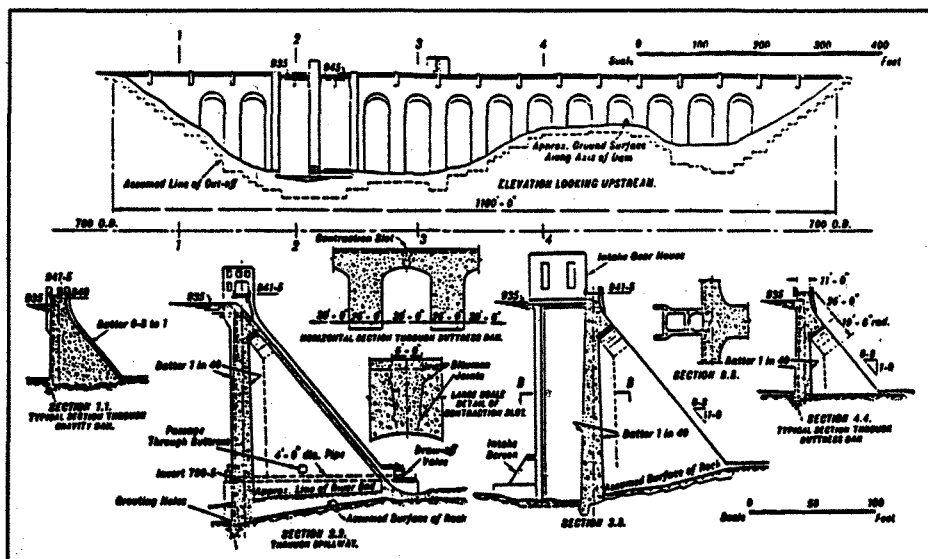
that to compare the prices of hydro power and power from coal (there was not then enough data to consider nuclear power) you have to compare two quite different things. By taking different but quite acceptable rates of depreciation and of interest charges you can come up with quite different answers, even if you agree about such things as the likely future ratio of peak load to base load. When considering whether to build more hydro stations, you come up against an even greater uncertainty: what will be the price of coal (or any other fuel) in 10, 20 or 30 years time? To answer these questions you need to be a clairvoyant, not an accountant.

The Mackenzie Committee never did find the answer. To settle the matter they recommended that the two Scottish electricity boards should be combined. This would have meant, in effect, that the Hydro Board would be taken over by the SSEB. But this was politically unacceptable. The Social Clause, though little used, was still on the statute book and 'the hydro' as it was known, still had a user friendly reputation, particularly in the rural areas; the SSEB has never been popular. The Hydro Board was therefore shackled to the SSEB by a Joint Generating Agreement, and rules of accounting were enforced that ensured the Hydro Board would never make a significant profit. These shackles were to remain in place until the coming of privatisation 30 years later. □

### Reference:

"The Hydro" by P L Payne; Aberdeen University Press, 1988.

■ This article is based on a paper by the author "Hydro Power and Electricity in Scotland". A second article, on privatisation and hydro power's future, will appear in the next issue of *Safe Energy*.



Loch Sloy dam: details

Source: The Hydro



## NFFO Order

**T**HE Renewable Energy Tranche of the English and Welsh non-fossil fuel obligation (NFFO) for 1991-98 has been set at 457MW, more than twice an earlier government estimate of around 200MW.

The Regional Electricity Companies have agreed to take power from 122 projects which will build up to a total capacity of 472MW by 1998. Only 75 schemes were accepted last year, totalling 102MW. Subsidy levels vary for the six technology types included.

Windpower has the highest per/kW subsidy because, say the Department of Energy (DoE), "wind technology has some way to go before it can be economically competitive". Landfill gas is considered closest to "independent commercial application".

Professor Littlechild, Director General of Electricity Supply at OFFER, put forward 205 projects that met with OFFER's requirements under five main criteria:

- technical viability;
- progress towards obtaining planning permission and other consents;

- adequacy of the arrangements for the purchase of the fuel;
- equipment, site and other items; and
- examination of whether the scheme's projected financial/economic performance was such that it could be expected to continue generation throughout the period to the end of 1998.

REC's had lobbied the Government to support fewer projects, arguing that a higher obligation will force the levy up and hence costs to consumers.

Whilst these developments can be attributed to the build up of pressure, from public surveys, all political parties and environmentalists, it is quite possible for the momentum to stall as pressure is slackened off, as in the case of Scottish renewables. In May, following the Association of Independent Electricity Producers' threat to invoke the Act of Union, Scottish Secretary Ian Lang forced the generators to purchase electricity from independents at 5.3p a unit. However, with a limit of 58MW, some independent schemes would be unable to sell all the electricity they produced. For the excess, the old rate of 1.9p still applies. The average would amount to around 4.9p per unit. This appears now to have been accepted by the independent generators. □

Band	The Order	The RECs' contracts
Waste		
MW DNC	261.48	271.48
No. schemes		10
price p/kWh		6.55
"Other"		
MW DNC	28.15	30.15
No. schemes		4
Price p/kWh		5.9
Hydro		
MW DNC	10.36	10.86
No. schemes		12
price p/kWh		6.00
Landfill Gas		
MW DNC	48.00	48.45
No. schemes		28
Price p/kWh		5.7
Sewage Gas		
MW DNC	26.86	26.86
No. schemes		19
Price p/kWh		5.9
Wind		
MW DNC	82.43	84.43
No. schemes		49
Price p/kWh		11.0
Total	457.28	472.23
No. schemes		122
Eventual cost to FFL* (£m/pt)		Approx £130m
FFL = Fossil fuel levy		
Source: Department of Energy		

1991 NFFO/Renewables Order

## Renewables concerns

**C**ONCERNS and doubts about the second renewables tranche within the NFFO have swiftly followed its unveiling and industry experts have taken the opportunity to voice their fears to the Commons Select Committee on Energy.

Representatives of both the British Wind Energy Association (BWEA) and the Wind Energy Group (WEG) claim that 50% of the projects approved in the latest round of the NFFO will have to be abandoned.

Dr Peter Musgrove, director of WEG, told Select Committee members that many of the projects had received only "minimal and inadequate scrutiny" by the Office of Electricity

Regulation (OFFER) and that backers would withdraw when they realised there is insufficient time to make a profit. He also implied that he would like to see OFFER take action against those who received contracts but failed to build projects.

The BWEA's Dr Ian Mays said it was "galling" that the 'will secure' test, designed to eliminate dubious projects, had not been applied rigorously by OFFER, and he expected the drop out rate to be high.

Schemes stand accused of not even monitoring wind speeds at chosen sites nor taking sufficient account of planning delays which would further erode time available to recover costs.

BWEA CHAIR, Dr Andrew Garrad, considered this NFFO gave little encour-

agement to Britain's wind industry and failed to acknowledge the contribution of the UK, and Scotland in particular, to Europe's overall resource. A leap in capacity for wind energy, from around 8MW to 100MW, was assured but more was required than just vague targets: "1991's capacity is only good news if it's followed by some established goals for 20 or 30 years, introduced in a progressive and phased manner."

Once again there were calls for urgent action to extend the cut-off date beyond 1998 and for government to revise its guidelines to local authorities on planning applications for wind farms. Garrad also stated that it was "singularly illogical" for Scotland to be excluded from the NFFO in light of it having the best potential in the UK and possibly Europe. □

## Environmental concerns

**T**HE 1991 NFFO Order came in for immediate criticism from environmental groups over the contribution of incineration and the paucity of the total.

Serious concern was expressed because more than half of the new order goes to incineration. Greenpeace say this is not a renewable but a polluter, arguing "there are continuing serious doubts about the dioxins and atmospheric pollution that incineration creates. It is not a proven tech-

nology." The 261MW incineration section of the order will equate to 3 million tonnes of waste, 570,000 tonnes of toxic ash and 4,600 tonnes of air pollution.

Friends of the Earth said in 10 years time, Britain would be approaching 2% energy capacity from renewables, "well behind other European countries". No doubt aware of the scope for criticism, the Energy Minister responsible for Renewables, Colin Moynihan, agreed to look into, with the European Commission, the possible extension of the renewables subsidy beyond the 1998 cut-off date. Significantly, he also said

the Government would reassess its target for renewable energy development of 1000MW capacity by the year 2000. The Department of Energy line now is that renewables could, "potentially produce 20% of our current electricity demand by 2025, if they can be commercially deployed".

Given the recent DoE report stating that 50% was technically available by 2010, we must now await either stricter environmental legislation aimed at curbing CO<sub>2</sub> emissions, or a far more determined effort led by government. □

## Coal scandal

**T**HE dirtiest industries in the country were always going to test the main planks of the Governments Environmental Protection Act 1990: Integrated Pollution Control (IPC) and BATNEEC - 'best available technology not entailing excessive cost'. But the intransigence of National Power and PowerGen is stretching relations with policy makers, the European Commission (EC), and enforcers, Her Majesties Inspectors of Pollution (HMIP), to breaking point.

The newly privatised companies were expected to be hard-nosed in their vigorous efforts to make early gains in the competitive market and satisfy shareholders expectation, but they have shown only total recalcitrance in responding to Europe-wide initiatives to achieve increasingly higher emission standards.

It is just two years since Margaret Thatcher made her exhortation to the UN General Assembly and the world, highlighting Britain's 'lead' in the enormous efforts necessary for the global clean up. She claimed that the UK "already has a £2 billion programme of improvements to reduce acid rain emissions from our power stations".

The structure to achieve this was the Tory environmental 'flagship', the 1990 Environmental Act incorporating IPC, where all emissions at each plant have to be considered together and minimised, and where BATNEEC must be employed.

At the European level, the EC Large Combustion Plant Directive (LCPD), will be effective from 1993, aimed at progressive clean up of all existing power stations. New plant is not covered by the LCPD and must instead must obtain maximum

emission control from the first day. The responsibility of compliance with the LCPD lies with the Government of each member state and in the UK responsibility for enforcement is with the HMIP.

HMIP is now squaring up to the generators over the implementation of BATNEEC, particularly in the test-case of Orimulsion combustion at the Pembroke 2,000MW oil-fired power station.

Generators intransigence is exemplified in their opportunistic pursuit of the use of Orimulsion in the face of European and UK efforts to tackle emissions. Orimulsion has a 3-5% sulphur content and high trace levels of heavy metals including the toxin vanadium. The last time this fuel was test-fired in Pembroke it resulted a corrosive black cloud engulfing a batch of new cars in a near-by lot. A compensation payment of £6 million was later made.

There are several reasons for the attraction to Orimulsion: it has a 9% higher heat content; its price is low and stable relative to the volatile oil market. Oil-fired power stations can easily be converted to its use. The generating companies have several such stations which were commissioned just before the oil shocks in the 70's. They are effectively mothballed, and are used only at peak times and therefore have very low load factors of around 6-7%.

National Power and PowerGen have contracts worth £5.5m of Orimulsion lined up for combustion in up-graded oil-fired stations.

In their efforts to generate as profitably as possible, the companies have come up with a number of alternatives to fitting expensive FGD equipment. At stations where they hope to burn Orimulsion they sought to fit only dust trapping precipitators, which would have minimal impact on sulphurous and toxic emissions.

More recently, generators have been

seeking the use of corporate targets as opposed to the site by site emissions targets, enabling them to reduce sulphur emissions at some plants and exceed levels at others. The fact that they switched in the first instance to a dirtier fuel did not, apparently, go down well in Europe.

No significant move has been made towards fitting FGD in the UK. Meanwhile, in Germany, one station was taken out of generation and FGD fitting completed in 18 months. Thatcher's grand £2 billion scheme to fit FGD at UK stations has been reduced to £0.5 billion to fit just one station, Drax, western Europe's largest coal-fired station. It is not possible to meet the original 1993 Drax A, and 1995 Drax B deadlines (*SCRAM 64*). Today it is expected to take 7 more years, with no SO<sub>2</sub> clean up in that time.

As far as the generators are concerned, FGD constitutes an excessive cost to the production of power from Orimulsion. To HMIP, the technology is readily available and should be used. They are rumoured to be considering changing the status of up-graded oil stations to new plant. The stations would therefore have to meet maximum emission control standards from the first day under the Large Combustion Plant Directive.

At the end of the day, one is left wondering how generators can be persuaded to incorporate FGD. In all probability they will merely close stations rather than pay costs for reducing emissions. Sources have suggested that licences for new gas stations being considered by the generators may be slow in coming if they are not more receptive to IPC.

Conversely, the generators may merely be holding out for appeal to the Secretary of State? After all, it was the Government that put them in this position. □

## US Bill

**W**ILDLIFE in Northern Alaska has been temporarily spared from oil drilling activities as the Senate have rejected the Bush Administration's National Energy Plan (*SCRAM 82*).

Alternative energy proponents now have the opportunity to lobby for a greater renewables contribution while the Bill is being redrafted. It will go back before the Senate early in 1992.

To the delight of environmentalists, who described the plan as a charter for "oil junkies", it was defeated by a surprisingly large margin.

It also included the streamlining of regulations for nuclear power plants and interstate pipelines. While it did include

references to conservation to enhance efficiency, it is felt that the delay will give more time for lobbying for a far stronger renewable component.

As a model for his revised plan, Bush could look to California where Republican Governor, Pete Wilson, has just approved an energy Bill promoting greater use of renewables and improved efficiency. It aims to open the way for increased regulatory support for renewables, and accounting methods that include environmental and social costs of power generation.

The Bill states that of the 11,000MW of extra power California requires by 2001, three quarters should be met by improved efficiency, 1,350MW by renewables and 1,350MW by conventional methods. □

## German support

**T**HE windiest German state, North Rhine-Westphalia, is determined to make full use of its renewable options. It has changed its financial guidelines to allow full accumulation of federal, state and local grants for wind power installations.

Under what is called REN, private energy saving and renewable energy projects can obtain state and federal support of up to 75% subsidies on capital costs. In addition, community involvement in projects can release local grants which could bring the total subsidy to 100%. □

Previously, the state offered 25% grants on capital costs to those qualifying for federal support, on the condition that the combined grants did not exceed 50% of the overall cost. Now it is possible to receive the 25% subsidy on top of the 50% maximum federal grant.

North Rhine-Westphalia is also leading the way in the transport sector. Grants up to DM10,000 are available for people wishing to purchase electric cars, on the condition that the electricity for the vehicle must come from solar or wind energy. This is available to people within the state who have shares in wind plant or their own photovoltaic collector. □

## Phototech

**S**OLAR power has taken a step closer to becoming commercially attractive for use in household applications, as two separate research teams are claiming major breakthroughs in conversion efficiency and economics.

Brian O'Reagan and Michael Gratzel, of the Swiss Institute of Technology in Lausanne, have developed a cell which replicates photosynthesis.

Using a thin base of titanium dioxide in place of high purity silicon and other expensive materials, it is estimated costs could be reduced by between 5% and 10%. The solar-to-electric conversion efficiency is around 7-12%, making effi-

ciency comparable to today's best amorphous-silicon cells. The design differs from silicon-based solar cells, where silicon does everything from absorption of light to the conduction of electrons.

Titanium dioxide is an abundant pigment used in whitener used in paint and toothpaste. It forms an extremely thin base, which is effectively transparent, superimposed on this an electrolyte layer and a light sensitive dye; a sandwich arrangement which mimics plant structure. Light penetrates until reaching the dyed layer which, as with chlorophyll, captures photons. The photons then release electrons into the semiconductor film of titanium dioxide.

The 'butter' layers of the sandwich are tin oxide, the lower of which conducts the electrons away as electric current; the

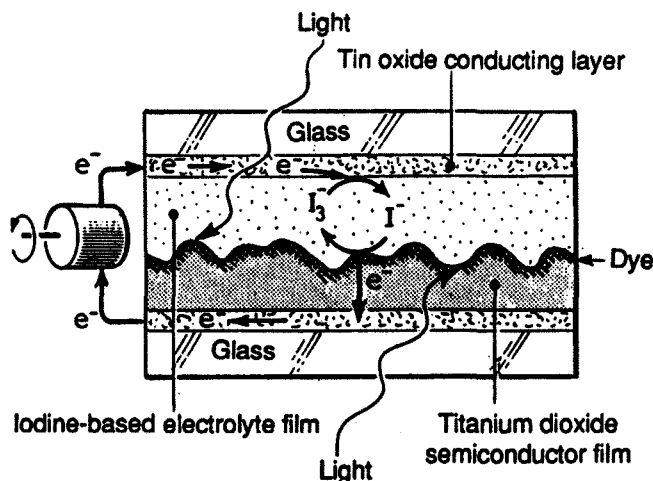
upper layer closes the circuit and conducts electricity back to the dye through the electrolyte.

The new panels convert around 7.1 to 7.9% of sunlight into useful electrical energy, producing around 150 watts per square metre of panel. An equivalent silicon panel costs around £400; the Swiss panels costs between £40 and £80.

At Imperial College, London, Dr Keith Barnham has developed a technique using quantum well structures. This involves reducing the amount of light energy lost as heat by sandwiching a semi-conductor, that absorbs a wide range of photon energies, between layers of a second semi-conductor that absorbs only high energy photons. This boosts the potential power conversion efficiency by 10% over conventional designs.

A prototype, with 30 quantum wells produced more than double the power output compared to one without wells. The result, says Barnham, working on a maximum solar cell efficiency of 25%, is that "the average household electricity, apart from space heating, could be provided by just over two square metres of solar collector, if 50% efficiency and suitable storage were available."

However, the preoccupation of funding nuclear power in the UK has had a negative effect on these technologies. Government spending in the last decade on solar power has been £500,000 compared to £3,000 million on nuclear research. Solar research in the US, over the last 5 years has received £140 million from government and industry combined, and in Japan over £100 million. Germany spent £85 million between 1985 and 1988. Such government and industrial support has placed foreign companies at a distinct advantage which tempers any euphoria over developments here. □



## Carbon tax

**I**NTERNATIONAL efforts to curb greenhouse gas emissions took a major step forward when the idea of a carbon tax received the backing of Makoto Taniguchi, General Secretary of the Organisation for Economic Co-operation and Development (OECD), in November.

At a conference in Sydney, he said fossil fuels could not be made totally non-polluting and "all countries should ideally shift their dependence on fossil fuel sources to clean, renewable sources, as soon as possible".

An OECD computer study into the impact of carbon taxes shows that coal use will decline by as much as 65%, with a quadrupling of its price, but no estimates were available for the impacts on oil and gas from such measures.

Taniguchi's preference is for placing emphasis on the use of new technology to reduce emissions and cut wastage, rather than setting unrealistic

emission targets.

Despite growing support for a carbon tax, the concept still faces considerable opposition. A tax, such as that proposed by the European Commission (*Safe Energy 85*), would have an inevitable increase on prices, with an estimated rise in domestic fuel bills of 15% and petrol of 6%. This would affect poor families worst by adding around £1.45 per week to bills; around 1.4% of total spending. The wealthiest would pay just under £3 more, 1% or less.

The intention is that the tax should be a neutral one with no increase in the overall tax burden. It could therefore be balanced by various means, by reductions in VAT or income tax, for instance.

Moves, such as full recognition by the OECD, would alleviate major fears of Britain and the European Community being left at a manufacturing and trading disadvantage, though its impact on Third World countries has yet to make the political agenda. □

## Finnpower

**F**OLLOWING the success of district heating in Sheffield, a Finnish consortium of energy companies, Finnpower, is looking to move into Glasgow and Edinburgh where it is viewed as a cost-effective solution to damp homes.

Ekoco Energy Ltd, one of the Finnpower companies, was jointly involved with Sheffield City Council in the first UK district heating scheme. The system grew from covering 4,200 council flats in 1988 to 10 large city blocks a year later. Total cost was £7m.

12 miles of 300mm diameter pipeline was laid to carry some 40MW of heat, the schemes full potential is 400MW of heat.

Director of Finnpower, Dr John Nelson, based at the Finland Trade Centre in London, describes the system as one "built as a modular concept. You can start with a small unit under 10MW. Construction time is very short."

Finnish companies have considerable domestic experience of combined heat and power systems (CHP) for district heating. CHP plant generates 25% of total power output in Finland. In Britain it contributes only 2%. □



## Nuclear Power and Global Warming

A lot of money is being spent on promoting nuclear power as an environmentally-friendly energy source. Humanity can't afford to let this go unchallenged. The Centre for Alternative Technology demonstrates the real safe alternatives to fossil fuels. Our education facilities creatively bring people in touch with the planet we all depend on for our survival. Being "green" starts with a recognition that it is impossible to survive if we destroy that which keeps us alive. The Centre's purpose, then, is to promote Earth-friendly practices as well as point out the causes of today's environmental problems. You can help us in our work by joining the Alternative Technology Association.

As a visitor to the Centre, you may be inspired to change your life. As an ATA member you can actively work for change, encouraging others and leading by example. You will receive Clean Slate, the AT magazine, and have access to CAT information and education publications and facilities.

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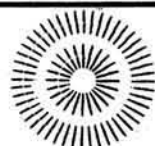
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## GENERATING PRESSURE

**SAVE  
DRURIDGE  
BAY**



### GENERATING PRESSURE

**The Campaign against Nuclear Power at Druridge Bay**

"An atomic power station? It can't be true!" Plans for one in your favourite beauty spot have just been revealed. What do you do?

The people of North East England faced this problem when they discovered in 1978 that unspoiled, windswept Druridge Bay in Northumberland was to be the site of nuclear power stations.

The horror of the proposal roused people who had no experience of political campaigning. From the simplest beginnings, the Druridge Bay Campaign built up into a formidable pressure group. Bridget Gubbins, former teacher and mother of four, tells the story from within.

She describes the development of the Campaign as it learnt to respond to the moves of the nuclear power industry. The story includes the main arguments while following the twists and turns of the campaign, from alerting local people to lobbying politicians.

**GENERATING PRESSURE** is a lively description of the role of a pressure group in a democracy. It is a grassroots account of what it is like to belong to one, and tasks and pitfalls are vividly recounted.

Everyone in the North East knows someone in this story. Everyone elsewhere will know some of the national figures who have come to support the Druridge Bay Campaign.

"There's a lot to be learned about the nature of citizen protest and the dynamics of mobilising individuals and whole communities in the art of exerting democratic pressure"

Jonathon Porritt, writing in the Foreword

A5 size, 160 pages, 29 photos, 10 drawings and maps

Published by Earthright publications, price £4.95

Available from Druridge Bay Campaign, Tower Buildings, Oldgate, Morpeth, Northumberland NE61 1PY

# REVIEWS

## Global Environmental Change; Edited by Robert Corell and Patricia Anderson.

NATO ASI Series, Springer-Verlag, Berlin;  
1991, 264pp.

This book sets out NATO intentions for an ambitious five year research programme with no less an aim than understanding the interrelationships of the physical, chemical, biological and social aspects of Global Environmental Change.

Global environmental change (GEC) has come at a good time for the scientific community. Public awareness of the ecology of the world's land masses, oceans and near space is greater than ever and threatens to reduce the status of 'experts'.

Some of the projects discussed are of merit, such as those focussing on the frequency of ENSO (El Nino and the Southern Oscillation) - the coupled warming of the ocean and atmosphere off Pacific South America. This could provide information, with practical applications, on the large scale biological productivity in the tropical Pacific.

The problems stem from NATO's overemphasis on the physical, mechanical and chemical characteristics influencing GEC, all of which will no doubt be comforting as water laps around the

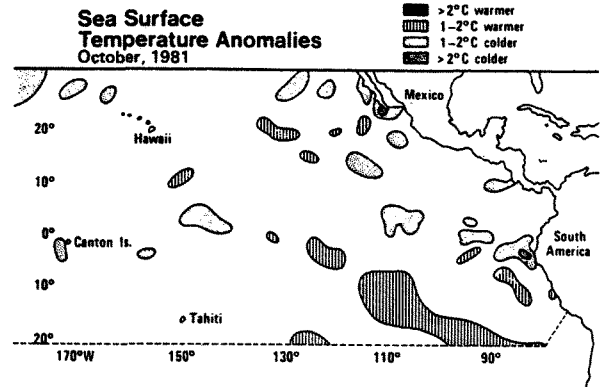
ankles of thousands of people in the southern hemisphere. The inclusion of the human factors in this multidisciplinary work are decidedly light-weight and cross-linking with the social sciences occurs only in the proposals by the Royal Swedish Academy of Sciences.

By ignoring the wealth of environmental expertise and resorting to specialists such as hydrologists, who can only conclude that energy and conservation are at the root of the problem, the programme hints at an underlying political agenda.

But crucially we have to consider how NATO is intending to extend its now outdated defence role. Like many governments and industries, NATO is looking to the environmental issues for longevity, but its primary function remains - the defence of the existing world order.

Perhaps this becomes most apparent with its recourse to quotes from well known environmentalists like Reagan and Thatcher, but more it is in the response to the Shultz exhortation to academia, to take up the challenge of "intellectual adjustment" in this "time of profound change".

### Sea Surface Temperature Anomalies October, 1981



### Sea Surface Temperature Anomalies October, 1982

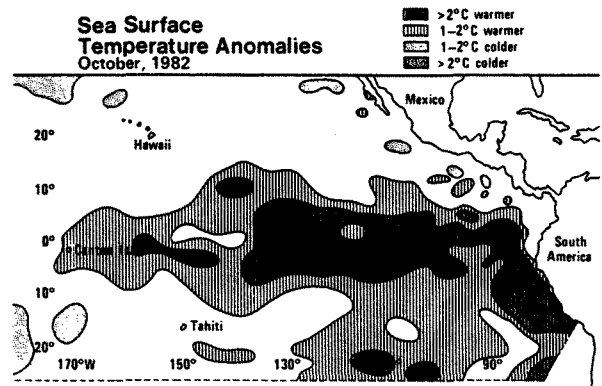


Figure 2 El Niño SST anomalies for an event (1982) and a non-event (1981) year. The cold regions along the equator (Oct 1981) are often more fully developed at the extreme of the cold phase.

For if they do not come up with sophisticated equations, beyond the 'ken' of normal folk, then these experts, like today's politicians, stand to lose the privileged position they hold with the demise of the existing order.

While there are, no doubt, well intentioned contributors to this programme, it has to be questioned whether an organisation such as NATO should control such a programme. It is

unable to include the contribution of the existing social and economic order precisely because its primary function is to perpetuate this order. It is inevitable therefore that some of the projects that make up the overall flavour of the programme engender the belief that it will satisfy none but proponents for 'business as usual'.

DAVE SPENCE

## Management of Radioactive Waste: The Issues for Local Authorities. Edited by Stewart Kemp.

Thomas Telford Publications; 1991, 177pp, £30.

With the Government's plans for radioactive waste management plumbing the depths of science fantasy, exemplified by Nirex's wish to drop intermediate-level nuclear waste down a deep hole in Cumbria, it is more important than ever that Local Authorities (LAs) take an active role in searching for a sane waste

management policy.

Presented here are the proceedings of February's "Management of Radioactive Waste" conference organised by the National Steering Committee (NSC) of the Nuclear Free Local Authorities, they offer not only a guide to the main issues affecting Local Authorities but are also a use-

ful tool for campaigners who want their LA to take a more active role in the debate.

The volume includes papers on: deep disposal by W D Biggs; Highland Regional Council's response to Nirex by Chris Claridge; high-level waste by Phil Richardson; reprocessing, disposal or storage by David Lowry; military radioactive waste by Rob Edwards, Rosyth by M Courtis, legal issues by Jamie Woolley; and waste disposal is there an acceptable problem? by Stewart Kemp.

NSC Chair, Ian Leitch, points out: "Whether or not the indus-

try and weapons which give rise to this waste have any future, their dangerous legacy will always be with us."

MIKE TOWNSLEY

## Housmans Peace Diary - 1992

More than a diary Housmans Peace Diary has a directory packed full of contact addresses and phone numbers of environmental and peace groups throughout the world. Price: £4.95.

# REVIEWS

## Electricity in Europe: the triumph of free enterprise? by Andrew Holmes.

Financial Times Business Information;  
June 1991, 144pp, £225.

Far from the turgid text one might expect given the title, Andrew Holmes – always happy to throw in an interesting turn of phrase – brings life to the commentary. Only in discussing the finer points of the English and Welsh electricity 'pool price' mechanism, does the content swamp the style.

The most notable section, on UK privatisation, chronologically recalls key moments; events whose significance and inter-relation had become blurred or forgotten are laid out afresh. What a haphazard and ill thought out process it was – the end result a hotch-potch, without even much in common with the free market doctrine by which it was conceived.

John Wakeham's claim, in March '91, that UK privatisation "is increasingly likely to be seen as a model for the rest of Western Europe's energy

sector", is quoted, analysed, and rejected.

Holmes outlines the electricity supply industries and likely trends throughout western Europe, both by fuel type and by country; the latter an interesting tour showing the diversity that remains within the EC.

The conclusion is that a free market in EC electricity, post 1992, is an ideal from which even its original champion, Electricité de France, is backing away. Inter-country trade of electricity between utilities is well established but the free trade between individual customers and Europe's generators remains a distant logistical nightmare. Holmes observes that "in the end [1992 will] give EC utilities the right to go on doing what they have done in any case: trade electricity to mutual benefit."

On nuclear power, "the

most centrist and bureaucratic power mankind has ever devised", Holmes' forecasts "Eventually ... even governments will learn that nuclear power is forever jam tomorrow," and observes that "decommissioning devises its own arithmetic."

On electricity regulation, I will forever more be stuck with Holmes' image of Prof Stephen Littlechild as Jiminy Cricket, the conscience of the electricity industry's Pinocchio.

Generally, the report is careful to point to trends rather than make firm predictions. Such an approach was foreshadowed by Holmes in the introduction, where he remarks, "forecasting has gone the way of Rubik's Cube and the filofax. It was replaced in the 1980s by the scenario, which was a way of making numerous forecasts simultaneously and taking responsibility for none of them."

Given the author, publisher and price, it was disappointing to discover a few factual inaccuracies – the most glaring of these being the misnaming of Hinkley as Heysham, and the increasing

of Scottish nuclear generation from its actual 55%, at best, to a remarkable 75%. These aberrations should not detract unduly from an otherwise excellent document.

My own conclusion from the report and I suspect Holmes' as well is that electricity production undertaken according to "the culture of the engineer ... everything proved methodically and comprehensively before taking any step forward ... [with] an ethos of public service" is preferable to the culture of "the futures broker or the venture capitalist" and "Entrepreneurs [who] take high risks for high rewards."

As Holmes notes: "The obligation to supply, which was to be transferred from the CEBG to the Regional Electricity Companies, was lifted from them and, indeed, disappeared altogether". This particular folly may be brought home to the south of England all too soon, should the Magnox stations have to be shut down wholesale at this years end, as by their condition they ought.

GRAHAM STEIN

## Using Wind Power.

Proven Engineering Products Ltd;  
1990, 32pp, £3 inc p&p.

This is an invaluable booklet for those who would like to know more about stand-alone (as opposed to grid connected) small wind turbines, up to the size needed to power and heat a house.

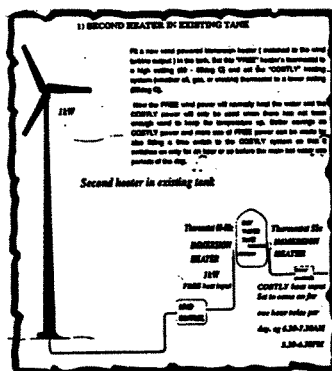
It includes information on storage, site location and energy audit sheets comparing households using low energy and standard energy appliances. These clearly show the large savings to be made by switching from energy greedy appliances.

Aimed at those who would like their own turbine, it describes various systems from water heating using a 1kW turbine to a central heating

system powered by a 6kW turbine, with admirable clarity.

DAVE SPENCE

Proven Engineering Products Ltd,  
Moorfield Industrial Estate,  
Kilmarnock, KA2 0BA.



## Educated Energy Management; by David Somervell and Roger Talbot.

University of Edinburgh; 1991, 80pp, £20

This publication is a working guide for all those involved in the energy management of educational buildings, from directors of education to staff and students alike.

Health and environmental problems, from sick building syndrome to global warming, are examined in Chapters 1 to 3, while other chapters cover a wide range of energy and environmental practices; from combined heat and power, financial appraisal and management, to energy audits and surveys.

As Technical Manager for Stirling Heatsave Group, I was particularly interested in the chapter on staff devel-

opment and training. It recommends a 'team approach' to good housekeeping standards and involves energy conservation education for students of all ages.

With the inclusion of a number of case studies from around Britain, Somervell and Talbot succeed in bringing together, for the first time, the collective expertise and experience of a wide and diverse field in a well collated and easy to read publication.

RON HILL

Available from Bookson Mail Order, 71 Nile Grove, Edinburgh EH10 4SN with £1.50 p&p



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# LITTLE BLACK RABBIT



## Safe Nuclear 1

British Nuclear Forum are the chaps who have been running full page ads in the press under the slogan "come to nuclear power with an open mind". Their own minds, however, are far from open. Nuclear Forum (NF), their monthly magazine, views its paymaster, the nuclear industry, through rose coloured spectacles. However, even NF is struggling to maintain the pretence of nuclear power as "clean, cheap and safe". They have now come up with a slightly less catchy slogan: "clean, acceptably cheap and certainly safe enough." Little Black Rabbit wonders if "acceptably cheap" is the opposite of unacceptably cheap or of acceptably expensive. And how safe is "certainly safe enough"?

Hydro power, they inform us: 1) needs huge tracts of land; 2) can disrupt eco-systems. NF can only find one problem with nuclear power: "difficulties with public acceptance on waste and safety." The article concludes "Information and education are the key to nuclear progress."



## Son of Safe Nuclear

The nuclear industry's search for their holy grail, a safe nuclear reactor (to standards slightly more rigorous than those required by NF), continues undeterred by the realities of science.

Rival companies and consortia are producing some novel ideas, the most notable coming from Electricité de France. Guaranteed to reassure all those worried by the China Syndrome, they have a special pit below the reactor hopefully named the "core catcher".

urging the Government to break up the privatised duopoly.



## Party pieces

Word has reached LBR of the efforts of electricity producers at the autumn Party Conferences. National Power's stand in Brighton for Labour was dominated by coal-fired power stations, Drax B in particular. By the time the stand got to Blackpool for the Tories, out had gone Drax, in came wave and wind power.

At least more consistent, were Nuclear Electric, whose stand was the same for both conferences, it might have been better though for a company at the forefront of modern technology, if their video display had been able to match up the pictures with the soundtrack.



## Safe Nuclear 2: return of NF

Having stuck by the attribution "clean", NF examines "the three cleanest energy sources": wind, hydro and, yes you guessed it, nuclear! They suggest that "all earn black marks in one way or another."

Wind power falls down on two points: 1) Stop-go supplies; 2) no means of energy storage. - running this as two points is at least a case of having their cake and eating it.



## The spice of life

Michael Spicer - the man who as junior energy minister gave English and Welsh electricity consumers the NationalPowerGen duopoly - has a new job.

As president of the Association of Independent Electricity Producers, Mr Spicer's main task will be, wait for it,



## Red bill

The Government's efforts to encourage energy saving were given a boost with the setting up of a committee, chaired by Energy Secretary John Wakeham, to put Whitehall's own house in order. Slightly embarrassing, then, that high on the agenda for their next meeting will be the gas bill for the Department of Energy's HQ. £20,444 in 1989/90, the 1990/91 total is £49,673. Someone must have forgotten to close a window.

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