

THE SAFE ENERGY

June - August 1996

JOURNAL

ISSUE 109

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Solar hydrogen powers ahead

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Following the retirement of Crispin Aubrey, **Stop Hinkley Expansion** is looking for a new person(s) to take over the role of leading a new campaign centred on the nuclear industry's continuing activities in Somerset.

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The **Press Officer** is responsible for dealing with media enquiries, issuing press releases and producing the bi-monthly newsletter.

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Cancer misreporting

SELLAFIELD cleared of leukaemia link — *Financial Times*; Cancer cluster 'not radiation' — *The Guardian*; Sellafield radiation ruled out — *The Independent*

Anyone reading any of these headlines, or others like them, might reasonably assume that radiation had been ruled out as the cause of increased cancers near Sellafield. *The Guardian*, with its use of quotes, at least leaves open the possibility of an alternative viewpoint. However, none of the headlines are accurate. And the articles that followed continued in the same vein.

The subject of these stories was a report by the Committee on Medical Aspects of Radiation in the Environment (Comare) which did not give Sellafield the clean bill of health implied by the newspaper coverage. The report's only real conclusions were that there is an excess of cancers at Seascale, near Sellafield, and that the cause or causes have not been identified.

The report did, however, show that the excess of cancers at Seascale has coincided with the radioactive discharges from Sellafield. It is known that radiation can cause cancers of the types found at Seascale. The committee acknowledges that the excess cannot be explained "on the basis of current scientific knowledge". Common sense and the precautionary principle would dictate that the radioactive discharges from Sellafield should be reduced.

As well as the unknown cause of the excess of cancers, a further mystery remains: why did so many papers follow the same, inaccurate, line and by whom was it being peddled?

Climate action needed

GLOBAL climate change is potentially the greatest environmental problem we face. It is vital that the developed countries take a lead with decisive action to reduce carbon dioxide (CO₂) and other greenhouse gas emissions.

News that the European Union (EU) may well fail to meet its modest target for CO₂ emissions — stabilisation at 1990 levels by the year 2000 — is therefore of great concern. The EU countries have the resources to meet and surpass this international commitment with little or no sacrifice: energy efficiency measures are available, many at no or even negative net cost; and renewable energy costs have fallen to the point where they are, arguably, already competitive with other sources of power. What is lacking is not the technology or the resources but the political will.

If we in the EU aren't prepared to make the modest effort asked of us, how can we expect less developed countries to make the very real sacrifices required of them. If they follow our deforestation, high-energy, fossil fuel development path, then the scientific theories on climate change will be put to the test all too soon.

Nuclear shares: a good buy?

WITH the timetable set for a mid-July floatation, it looks like nuclear power is finally to be privatised, or at least some of it is.

The government seems to have managed to keep enough of the risks, liabilities and debt in the public sector to persuade the City that there's a profit to be made from nuclear power.

However, there are some notable City companies who have decided to sit this privatisation out. This may prove to be a shrewd decision on their part.

In preparing for the government review of nuclear power in 1994/5 and then for privatisation, the UK's nuclear power stations have been operated for short-term output, not long-term performance. Cutting corners on maintenance and operating practices is short-sighted in any industry and — as we saw with the recent accident and subsequent prosecution at Wylfa — in the nuclear industry it is potentially disastrous.

The improvements in performance being forecast for the AGRs is unlikely to materialise, indeed a drop in performance may be the inevitable consequence of operating practices over the past six years.

Added to this is the risk of generic faults, as has already been seen most recently over the on-load refuelling problem at Heysham B which forced the money-spinning practice to be halted at its sister station, Torness.

Another uncertainty is the role of the regulators. The dramatic impact of the regulator was demonstrated just last month in the gas industry. Regulation in the nuclear industry is an altogether more complex business. There can be no guarantee for shareholders that future regulation of a privatised industry will not be far stricter than has been the case in the public sector.

For all these reasons, the output from British Energy's power stations may be much lower than forecast. And not even this government has been prepared to offer shareholders a dividend on power stations that aren't generating electricity. □

"Sellafield's excess cancers", p6; "EU carbon worries", p23; "Nuclear privatisation", p4

"Common sense and the precautionary principle would dictate that the radioactive discharges from Sellafield should be reduced."

The Safe Energy Journal is the international magazine of Friends of the Earth Scotland's Safe Energy Unit. Views expressed are not necessarily those of FoE Scotland.

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Nuclear privatisation at any cost

AFTER climbing down on its promise that nuclear "liabilities will follow assets" into the private sector, the government says it is on target for the planned nuclear sell-off in July.

After months of hostile negotiations between government ministers and British Energy (BE) — which took over responsibility for the UK's Advanced Gas Cooled Reactors (AGR) and its Pressurised Water Reactor on April 1 — the level of debt to be carried by the company into the private sector has finally been settled.

The government has agreed to more than halve the £1.5 billion it calculated to be the level of debt the new company should shoulder in order to obtain a fair deal for the taxpayer following privatisation. BE will now have a debt of £700 million.

Earlier this year the government threatened to pull the plug on the privatisation in the face of BE's insistence that the level of debt must be reduced. In response it is believed that BE Chair, John Robb, said such a debt would make it impossible for the company to operate as a commercial concern and threatened to resign.

Initial government calculations that BE would have to contribute at least £30 million annually into a special segregated decommissioning fund have also been overturned. The company will now contribute a mere £16 million. An initial endowment of £230 million will also be paid into the fund by BE. Mike Sadnicki, an independent operational research consultant, commissioned by Friends of the Earth and the Consortium of Opposing Local Authorities to examine proposals for the fund says this "is likely to lead to subsidisation of the purchaser by the taxpayer." Allowing such low contribution could also be viewed as being in breach of European Union rules on state aid. According to Sadnicki a minimum annual contribution of £127 million is required. ("How a factor of ten disappears", p8)

The government's adviser on nuclear privatisation, BZW, has cut the amount it thinks can be raised by the privatisation from between £2.4 billion and £2.8bn to between £2.25bn and £2.5bn.

However, even the new lower figure is being treated with some scepticism in the City. While the government has managed to put together a syndicate of seven banks to market the privatisation both at home and internationally, some names are conspicuous by their absence.

Key City players, and experts in previous privatisations, like UBS, NatWest, Warburgs and Klienwort Benson are thought to have been unwilling to back BZW's optimistic calculations.

Indeed two of BZW's central assumptions in deriving a value for BE, have recently been brought into question. BZW assumes that the pool price for electricity in the UK will not fall below the current level of 2.4p a unit; however, National Power and PowerGen have told the Monopolies and Mergers Commission that they both expect the price to drop over the next four years. Increased competition and low gas prices



could well see the pool price fall to below 2p a unit by the turn of the century.

BZW also claims that the performance of BE's stations will continue to improve from their current high level of just under 70% availability to 82%. However, the closure of Heysham-2 for 18 days earlier this year during on-line refuelling casts extreme doubt on BZW's performance predictions. The station shut down after a fuel assembly became jammed in a fuel channel and the reactor was tripped by automatic safety systems. The future viability of on-line refuelling at Heysham and its sister station Torness — where Scottish Nuclear has also stopped on-line refuelling following the Heysham incident — will remain in doubt until after the July sell-off when an investigation into the problem by the

Nuclear Installations Inspectorate (NII) should reveal whether it was a one-off or the result of a generic design fault.

According to industry analyst and adviser to the Trade and Industry Select Committee, Gordon McKerron, any threat to on-line refuelling could "fundamentally affect the value" of the sale.

Captain Richard Killick, the recently retired director of safety at Scottish Nuclear, said: "This certainly has commercial implications as this is one of the more important measures to improve the economics of nuclear power."

BE has denied that there are any implications for a successful privatisation arising from the problem, arguing that on-line refuelling, if given the go ahead by the NII, would merely be a bonus and is not central to its performance calculations.

Adding insult to injury, one of the two AGR reactors at Hunterston B was shut down in April when a steam leak was discovered in the concrete reactor. A weld in boiler pipes contained within the reactors pressure vessel is believed to have cracked.

Brian Wilson, the local Labour MP, said the incident supported the widespread belief that the UK's nuclear stations were being "driven too hard" in the run-up to privatisation.

■ Safety in the privatised industries — including nuclear power — is being compromised by budget cuts at the Health and Safety Commission (HSC) according to a letter to the Environment Secretary, John Gummer, written by the commission's chair, Mr Davies.

In the letter, obtained by *The Guardian*, Davies says that unless funding is increased the HSC "will conclude that we cannot meet all the expectations and requirements that government, Parliament and the courts are placing on us with the resources now available."

Trade unions have been arguing for a number of years for an increase in the number of on-site visits by the Commission's inspectors. They say staff cuts are allowing companies to cut safety corners in the drive for increased profits. Staffing levels at the HSC have fallen by 300 since 1993 to 3,900 and are expected to continue to decline to less than 3,400 by the turn of the century.

The shadow employment secretary, Ian McCartney, who originally received the leaked letter said: "It shows that public concern about safety standards in British industry, including the privatised and soon-to-be-privatised industries is fully justified." □

G7 discusses Chernobyl

ON April 24, as the tenth anniversary of the Chernobyl disaster approached, a fire raged through five villages in the region, once more throwing radiation-laden smoke into the surrounding air.

Believed to have been caused by a cigarette discarded by one of the many former inhabitants of the region who had returned to visit the grave sites around their homes, the blaze lasted seven and a half hours. According to Greenpeace, readings taken by Chernobyl's Department of Radiation Monitoring showed a "four to five fold" increase in caesium levels. However, Ukrainian news reports said the radiation increases were insignificant.

A decade on and the death and injury toll from the disaster is still the subject of a fierce propaganda war. While some Western scientists claim that only 45 deaths have occurred, the Ukrainian Health Ministry says that 125,000 Ukrainians have already died as a result of the accident, while tens of thousands have radiation-induced crippling illnesses and the incidence of thyroid cancer in

children has increased one hundredfold.

David Kyd, of the International Atomic Energy Agency disputes the Ukrainian figures, arguing: "those giving higher figures tend to be people who want to draw attention to what happened and gain sympathy."

At an April meeting in Moscow of the G7 and Russia, the Ukrainian Prime Minister, Leonid Kuchma, agreed to meet a commitment to close Chernobyl by the year 2000 after receiving a pledge of £1.5 billion in aid and a promise of help in determining how to replace the dangerously cracked sarcophagus which encases Chernobyl reactor number four ("Chernobyl: a non-nuclear alternative", p10).

The G7 meeting was also presented with a report from the International RBMK Consortium, funded by the European Union and Canada, which argues that Soviet designed reactors are not as dangerous as previously thought. Michael Hayes, a former Harwell scientist who chairs the consortium involving 170 scientists from 11 countries, says: "They are much more benign beasts than we

previously thought they were. The back-fits to them make the prospect of another Chernobyl very unlikely."

The consortium says that the nine newest reactors can probably be operated safely for many years provided that they are constantly monitored, while the risk of another Chernobyl occurring among the six oldest can be significantly reduced by installing emergency core cooling equipment and enhanced reactor containment where possible.

Germany, which was among the most vociferous in calling for the closure of the reactors, is at the heart of the new attitude. According to the German environment minister, Angela Merkel, any demands for closure would mean a loss of potentially lucrative business for the western nuclear industry. "A third party will get the business and the last laugh," she said.

The final communiqué from the summit backed the consortium's position arguing that existing reactors should be upgraded rather than be shut down. □

US lobby

AS the US gears up for presidential, congressional and gubernatorial elections, a new nuclear lobby has been formed — the Eagle Alliance — which hopes to "achieve pro-nuclear planks in major political parties for the 1996 elections."

High on the list of the alliance's founding members are the heads of four Department of Energy (DOE) labs at Brookhaven, Los Alamos, Argonne, Oak Ridge, and the DOE manager at Idaho Operations. According to the US Nuclear Information & Resource Service "their presence ... raises serious conflict of interest charges."

The alliance also boasts a number of other "heavy hitters", including the President of the National Treasury

Employees Union and senior officials in the American Medical Association and the American Cancer Association.

While not publicly committing itself to promoting more nuclear power stations, the alliance is focusing on other so-called 'Atoms for Peace' benefits. Two key aspects of its promotional work will be: the "stimulation of major use of food irradiation ... promoting food irradiation as a process rather than an additive" and encouraging "at least one major retailer selling irradiated food"; and establishing a "strong scientific basis for negligible health effects of low-level radiation."

In the run up to the elections it is planning to "orchestrate a 'Nuclear Freeze' day with wide public coverage to dramatise everyday services provided by nuclear technology". □

Swedish phase-out

SWEDEN has reaffirmed its 16-year-old commitment to phase out nuclear power. Plans to close the first reactor by 1998 have been approved by the ruling Social Democratic (SD) party.

Over half of the country's electricity is produced by 12 nuclear reactors, and according to a parliamentary commission report, published last year, it will cost about £8.2 billion to meet the 2010 target shut-down date.

A combination of renewable energy sources, biofuels in particular, and increased energy efficiency will fill the gap left by the nuclear industry. However, the SD energy minister, Jorgen Andersson, has warned the phase-out will not be easy. It will require an expenditure similar to that committed to the nuclear industry in the 1970s and '80s.

It may also mean increasing reliance on natural gas and choosing between meeting strict targets for carbon dioxide emissions or exploiting the four remaining wild rivers in the north of the country for hydro power. □

Monju

DESIGN flaws in a temperature gauge were responsible for a massive leak of sodium at Japan's experimental Monju fast reactor in December, according to an interim report by the Science and Technology Agency. ("Monju leak", SEJ108)

According to the report the manufacturers of the gauge, Toshiba Corp and Ishikawajima-Harima Heavy

Industries, misinterpreted the specification set by the US machinery society. The constant flow of sodium bent and broke off the thin 18cm gauge.

No date has been given for the reactor's restart but its operator, Power Reactor and Nuclear Fuel Development Co, faces an uphill struggle as the accident and subsequent attempts at a cover-up have rocked the foundations of Japan's commitment to pursuing a plutonium economy. □

Cancer excess: cause unknown

AFTER ten years investigating excess cancers in people under 25 in the village of Seascale in west Cumbria, near Sellafield, the government's Committee on Medical Aspects of Radiation in the Environment (Comare) has failed to find a cause, but in a new report* merely reiterates the existence of the excess over the last four decades.

The committee's failure to pinpoint the cause of the excess has been seized upon by British Nuclear Fuels (BNF), which operates the giant Sellafield reprocessing complex, as giving it a clean bill of health: "We are pleased that at last the spectre that radiation has caused these problems has finally been lifted from us."

Despite blaring headlines in most of the UK's quality dailies clearing Sellafield of any connection, the Comare report does no such thing. What it does say is: "Considering Sellafield discharges alone, both routine and accidental, the associated doses would have had to be 200 times greater to account for the excess number of leukaemia and non-Hodgkin's Lymphoma cases on the basis of current scientific knowledge. We consider the probability of such a discrepancy to be highly unlikely."

However, revised figures for Sellafield discharges were supplied by BNF and calculated not for Comare but

principally for use in court cases where BNF was being sued for causing radiation induced cancers. This must cast some doubt on the legitimacy of Comare's own calculations and at the very least the independence of its work.

Comare also insert the significant caveat "on the basis of current scientific knowledge". At present, public radiation protection standards are set on the basis of calculations derived from the atomic bombings of Hiroshima and Nagasaki; the validity of this approach has been questioned by a number of eminent scientists, most notably Dr Alice Stewart who in the '50s drew the world's attention to the dangers of x-raying pregnant women. At the heart of the dispute over the use of the A-bomb figures is that they represent a high radiation dose over a short time which could be completely different in effect to the low doses over long periods of time experienced in the vicinity of nuclear stations.

According to Comare Chair, Prof. Bryn Bridges, "population mixing — when an immigrant population comes from one part of the country and goes into a relatively isolated rural area such as Sellafield" could be involved in causing the excess cancers through some form of viral infection. This again was simplified in the press coverage. However, the report itself comments:

"The evidence available at present does not convince us that such a large relative risk persisting over more than three decades could be wholly attributed to population mixing."

Occupational exposure to radioactivity has also been ruled out as a possible sole cause of the Seascale cancers.

Comare concludes that after four reports into childhood leukaemia and cancer around nuclear installations that such substantial effort breeds an expectancy of an unambiguous answer. However, the only unambiguous answer on offer is that there is definitely an excess in Seascale. "We have of course been constrained by the fact that mechanisms involved in human leukaemogenesis are still not clearly understood," Comare observes.

No new studies of the 'Seascale cluster' should be undertaken "until new insights into possible carcinogenic mechanisms suggest possible causes to test," concludes Comare. □

* "The incidence of cancer and leukaemia in young people in the vicinity of the Sellafield site, West Cumbria. Further studies and an update of the situation since the publication of the report of the Black Advisory Group in 1984." Comare Fourth Report; Department of the Environment.

Sellafield's radioactive waste

STORAGE of historic radioactive wastes at Sellafield and Drigg is less than satisfactory, according to the Nuclear Installations Inspectorate and HM Inspectorate of Pollution.*

Following a three-month inspection of storage facilities in 1994, the inspectorates have warned British Nuclear Fuels to put its house in order. They found plutonium stored in one building in leaking and rusting drums which were stacked so high as to be in imminent danger of collapse. Another

building has so many barrels in it that it was difficult to check the condition of the waste.

They also said: "More effort should be expended to generate accurate records of the accumulated wastes and to produce a site-wide proactive record keeping system."

Their report comments that it will be at least 45 years before some of the intermediate-level wastes will finally be disposed of long-term, in a deep underground repository, and it is

therefore vital that improvements are made.

It is believed that Nirex, the body responsible for establishing the UK's deep underground repository, pulled a £200,000 advertising campaign promoting the merits of deep disposal after getting wind of the report's critical nature. □

* "The management of solid radioactive waste at Sellafield and Drigg", Health and Safety Executive.

Mochovce

PLANs for the completion of the controversial Mochovce nuclear power station in Slovakia have been firmed up ("Mochovce moves", SEJ108).

Contracts, subject to financing, were signed with 11 companies from Slovakia, the Czech Republic, Russia, France and Germany on 16 April; and on 30 May

credit agreements worth nearly £600m were signed by Slovakia with a group of banks. Financing will come from a consortium of local banks and four foreign banks: Komerční Banka and Ceska Sporitelna of the Czech Republic, Kreitanstalt für Wiederaufbau of Germany and France's Société Générale.

The Slovak government has said that it will now close the oldest of its Soviet-designed reactors at Bohunice, within six years. However, there must be

considerable doubt about this. The guaranteed closure of Bohunice by the end of the century is believed to have been one of the main stumbling blocks to a funding proposal from the European Bank for Reconstruction and Development which fell through last year. Furthermore, the German company Siemens, to be involved in the completion of Mochovce, has a contract for upgrading Bohunice which concludes in 1999, making closure shortly thereafter unlikely. □

Australian waste sent to Dounreay

AUSTRALIA has sent 114 spent highly enriched uranium (HEU) fuel elements to Dounreay for reprocessing. The rods are expected to arrive at the port of Scrabster by the middle of June. Originally scheduled to leave in June, the shipment was brought forward to allow Dounreay to keep operating the HEU reprocessing plant which has run out of alternative work.

The Australian Nuclear Science and Technology Organisation (Ansto) had hoped to sneak the elements out of the Lucas Heights research reactor storage ponds and onto the mv Condock I, a cargo vessel. However, Australian Greenpeace activists managed to mount a significant demonstration which resulted in 20 people being arrested. The ship left Botany Bay, near Sydney, on April 21 with the help of a massive police presence, including a police helicopter.

A demonstration was also mounted by Friends of the Earth Scotland at the Australian Consulate in Edinburgh to protest against the shipment and highlight the double standards in Australia's attitude towards nuclear testing in the South Pacific and the management of its spent fuel.

Contradictions in the Australian attitude to reprocessing at Dounreay also emerged from the consultation held in the US over what to do about some 22,000 spent HEU fuel rods of US origin, stored around the world, which concluded earlier this year that Dounreay is not a suitable destination for such weapons-grade material.

In evidence designed to persuade the US to take Australian HEU of US-origin, Ansto and the Commonwealth Department of Primary Industries and

Energy said: "... Australia does not have a nuclear power industry, it is not in a position to readily accept for storage or disposal waste from reprocessing." They also warned of the proliferation dangers of allowing overseas reprocessing: "This would perpetuate undesirable worldwide holdings of HEU and the continuance of HEU use."

They concluded: "Australia's unique and large holdings of UK-origin, US-origin and unobligated (Australian-origin) HEU spent fuel lend some attraction to ... [the] domestic conditioning option in the circumstances of uncertain and expensive overseas options." Ultimately, Dounreay could receive over 1,000 elements from Australia for reprocessing.

More contracts

The UKAEA has said that the contract is the last it has for HEU reprocessing and that it will be stepping up its efforts to secure more. It further revealed that the en route elements will be the last which can be accommodated within the site's existing radioactive discharge permits. However, it is likely to be a number of months before the Scottish Environmental Protection Agency, which assumed the responsibilities of HM Industrial Pollution Inspectorate on 1 April, is in a position to rule on the site's application for revised permits.

News of the shipment prompted Scottish Labour to end its long silence on the issue of reprocessing at Dounreay. At its annual conference in Edinburgh in March the Scottish Labour executive expressed its support for the foreign reprocessing with the proviso: "Scottish Labour

states categorically that other countries will not be permitted to store waste indefinitely at Dounreay. We therefore insist on clear guarantees that, in the event of reprocessing taking place, all reprocessed materials are returned to their country of origin."

Meanwhile, further controversy has been sparked over Dounreay's waste shaft. An article in *The Sunday Times*, May 26, revealed that a leaked inventory of waste shows that in addition to large quantities of radioactive waste and an explosive combination of sodium and potassium, 101 spent fuel elements from the Dounreay Fast Reactor were also dumped in the shaft. The public inventory contains no mention of the fast reactor elements.

Dounreay has just commissioned six engineering consortia to conduct independent studies into excavating the shaft, following the government's demand for firm recommendations on its management by 1997.

The fresh controversy has prompted Labour shadow Trade and Industry minister in Scotland, Nigel Griffiths, to call for a public inquiry into the shaft's contents and excavation plans. He said a full inventory should be published to restore public confidence in the industry which has reached an "all time low".

After over a year of revelations about contamination at Dounreay, public confidence had been further dented in April when a survey into the extent of contamination at the site revealed 1,500 separate patches of radioactive contamination. The UKAEA has now cordoned off the contaminated areas and is formulating plans for a clean-up, including the possibility of removing the contaminated top soil. □

German nuclear waste transports

POLICE and anti-nuclear activists clashed in May when a transport of intermediate-level radioactive waste from German spent fuel, which had been reprocessed at La Hague in France, was intercepted by protesters on its way to the Gorleben store in Lower Saxony.

Despite attempts to keep the timing and route of the shipment secret, it was halted kilometres away from Gorleben, when it was being transferred from rail to a low-loader. It took 15,000 police to edge the waste into the store. An estimated 10,000 protesters amassed. One woman had to be flown to hospital

in one of the many police helicopters being used to keep track of the demonstrators. The police also used tear gas, water canon and baton charges to dislodge road blocks and disperse the petrol bomb-throwing hard core.

The shipment, the first of over a hundred scheduled to take place over the next decade, has once more called the future of the German nuclear industry into question. A further 50 shipments are also expected to come from Sellafield. Deep political divides already exist among Germany's major political parties where a large minority is pushing for a

phase-out of the industry.

Many commentators believe that the extraordinary costs of the police operation, DM55 million, for just one transport could run into many billions if the protest activities are maintained. In that case, it may ultimately block Germany's waste management plans and could result in its nuclear stations being unable to prove they have management plans capable of covering a 6 year period after spent fuel is removed from reactors, as required by law, and therefore lose their operating licences. □

How a factor of ten disappears

As the UK nuclear industry is prepared for privatisation, Mike Sadnicki questions the proposed level of British Energy's payments for long-term liabilities.

IN the build-up to a possible nuclear privatisation, perhaps the most crucial figure for potential investors in the City is the likely scale of annual payments by British Energy (BE) into a segregated fund for long-term liabilities. In evidence from the Consortium of Opposing Local Authorities (Cola) and Friends of the Earth (FoE) to the Trade and Industry Select Committee (Tisc) in November 1995, MacKerron & Sadnicki estimated the Segregated Fund Charge as £169 million per year.⁽¹⁾ The TISC Report in February 1996 cited figures of between £20 to £60 million per year.⁽²⁾ On 26 March in the House of Commons a proposed payment of £16 million per year was announced.

How can such different estimates arise from the same basic figures? A new study⁽³⁾ commissioned by Cola and FoE shows how estimates differing by a factor of 10 or more can ensue. The study shows that the low level of annual payments proposed by the government offers a disquietingly low level of reassurance to the taxpayer that significant AGR liabilities would ultimately be met by the privatised company.

Cola and FoE sent the study to John Bourn, Comptroller and Auditor General, on 17 April 1996, asking that the National Audit Office urgently investigate government plans for funding nuclear liabilities.

Fund coverage

Initially the government's nuclear privatisation plans proposed a segregated fund as "the best way of enstraining public confidence that the parts of Nuclear Electric and Scottish Nuclear which are privatised will meet their obligations in full and that the costs of meeting long-term nuclear liabilities do not fall to taxpayers by default."⁽⁴⁾

By the time Tisc reported, it was becoming clear that fund coverage might not extend to all liabilities. Tisc identified three important areas of post-operational liabilities which were not

covered, and a fourth possible exclusion emerged later:

- management and disposal of intermediate and high-level waste (ILW and HLW) this can last for another 100 years;
- decommissioning of British Nuclear Fuels (BNF) AGR-related facilities — technically covered by contracts with BNF, but in practice continuing into the mid-2070s;
- substantial quantities of spent fuel to be managed, including the reprocessing of the final core, after any AGR station has closed;
- Stage I decommissioning payments for AGR stations.

The second key factor which determines the size of the annual payments is estimated fund performance — the expected interest accruing to any calculated fund surplus in any year from 1996 to around 2130, the final year of decommissioning the last AGR.

The nuclear industry has traditionally used a discount rate of 2% for long-term liabilities, representing a minimum real rate of return which is expected to be achievable regardless of future economic conditions. Clearly in the medium-term, say 30 years, slightly higher risk-free returns can be achieved from Government index-linked gilts. Recently, and since the Tisc Report, British Energy has cited 3% for a fund growth rate, but with the growth rate applying for the full time period to 2130. In the House of Commons on 26 March a rate of 3.5% was quoted. It has also emerged since Tisc that the fund will have an injection of start-up capital of £230 million.

Annual payments

In the Cola/FoE study, each possible fund coverage is tested against each hypothetical fund performance, and for each combination the required British Energy annual contribution to a segregated fund has been calculated. For any defined level of coverage and performance, the calculations and results are relatively uncontroversial, since all calculations start from BE undiscounted liability totals as supplied to Tisc.

The full range of estimated contributions is from a maximum of £208 million a year to a minimum of £16 million a year. To achieve the lowest annual payments of £16 million a year, as proposed by the government, a seven-step process of successive relaxations is required, as shown in Table 1.

Choosing the level

Having explained the differences, the question turns to setting the correct level for the annual payments. As Tisc noted, the government's

TABLE 1: BRITISH ENERGY'S REQUIRED ANNUAL FUND PAYMENTS

Step	Basis on which fund set up	Annual Charge	
	Relaxation	Reduces by:	to:
		(£ million)	
	All post-operational AGR and PWR liabilities covered. 3.5% real rate of return achievable up to 2026; then 0%. No start-up cash.	Base level 208	per year
1	2% real rate of return achievable after 2026	81	127
2	3.5% real rate of return achievable after 2026	19	108
3	fund starts with £225 million	15	93
4	exclude AGR post-operational reprocessing from fund coverage	26	67
5	also exclude AGR Stage 1 decommissioning	15	52
6	also exclude payments for decom. of BNFL AGR related facilities	15	37
7	also exclude AGR post-operational waste charges	21	16

adviser BZW sees the issue thus: "an appropriate balance is being sought between giving the general public reassurance that these [liabilities] will be met when they fall due and not unduly reducing British Energy's commercial freedom."

The extremely low estimates of BE fund payments give the taxpayer very little reassurance whatsoever that post-operational liabilities will be covered. The Tisc recommendation: "... that the government establish more reliable arrangements to ensure that long-term liabilities arising after stations close are discharged,"⁽⁵⁾ is not being met.

First, exclusion from the segregated fund of long-term items, such as post-operational waste charges and post-operational payments for BNF decommissioning, simply does not provide sufficient reassurance. There would be too great a potential for the future company to default on the long-term liabilities, leaving them for the taxpayer.

Second, the proposed start-up of the fund with £230 million would represent subsidisation of the future company by the taxpayer. All available funds should be going to the Treasury, ideally to assist the setting up of a segregated fund for the Magnox liabilities to be left in the state sector.

Third, while a 3.5% per year segregated fund growth rate is achievable over say the next 30 years, the assumption that such a growth rate can be maintained until around 2130 is not credible. In addition, there are strong ethical reasons why zero growth should be used beyond 30 years, in line with government policy on sustainable development.

Fourth, lower annual payments also require the assumption that the costs of post-operational reprocessing and Stage 1 decommissioning of AGRs which shut down earlier are borne by the stations which remain. In fact, the Cola/FoE study demonstrates that individual AGR stations are not at all well placed to cope with the cash calls of others — indeed some may have an annual negative cash flow, even without such extra charges. Similarly, for five years around 2025, when Sizewell B will be on its own, there is a very high chance that it will not generate enough income to cater for all AGR cash calls.

Fifth, there are significant risks that the liability estimates for decommissioning and waste will prove too low.

All these considerations present a compelling argument for not relaxing fund coverage at all from the maximum possible. Thus the conclusions are:

- To give real reassurance to the taxpayer, the annual payment by British Energy to a segregated fund should be £208 million a year. This would fulfil the commitment given in the government's nuclear privatisation white paper and conform to its policy on sustainable development.

- Depending on the attitude to future generations, a relaxation might be considered to assume 2% growth beyond 2026. This would require an annual payment of £127 million a year.
- No other relaxations should be considered. It is fallacious to contend that later stations can cope with the reprocessing and Stage 1 decommissioning cash calls arising from earlier shutdowns.

No significant cash inflow

There is no easy solution — nor would we expect there to be. The Cola/FoE analysis indicates that the AGR tranche, taken together, will not generate significant positive cash flows.⁽⁶⁾ This conclusion is supported by evidence submitted to the government's nuclear review by the UKAEA.

If the annual contribution were set at £127 million a year, then the AGRs might break even — generating just enough cash to set up a fund sufficient to cover their liabilities. With such a starting position, it is impossible to create an arrangement which simultaneously reassures the taxpayer that liabilities will be covered, and also provides the prospective owner with low annual segregated fund payments.

Any arrangement which secures for the prospective owner payments at lower than the absolute minimum of £127 million a year will be diverting cash away from future liabilities towards current profits and dividends. As such it is likely to lead to subsidisation of the purchaser by the taxpayer, and could therefore be in breach of European Community law on state aid.

If the annual payment were fixed lower than the minimum level of £127 million a year, potential competitors of BE in the electricity supply market would have legitimate grounds for complaint since in such circumstances nuclear stations would clearly not be bearing their full generation costs. □

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"It is impossible to create an arrangement which simultaneously reassures the taxpayer that liabilities will be covered, and also provides the prospective owner with low annual segregated fund payments."

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* A copy of the full paper with full references can be obtained from Cola, South Somerset District Council, Council Offices, Brympton Way, Yeovil, Somerset BA20 2HT, (Tel 01935 462576).

Chernobyl: a non-nuclear alternative

Recent G7 support for upgrading of eastern European nuclear reactors is a dangerous move, argues Kate Muir. Investment in energy efficiency and renewable energy would be cheaper and safer.

AT the end of April the G7 leading industrialised nations met with the Russian and Ukrainian Heads of State in Moscow for what should have been a groundbreaking summit on nuclear safety. Among the issues on the agenda was the Memorandum of Understanding previously agreed between the G7, the European Union and the Ukrainian government for the closure of the remaining reactors at Chernobyl and the development of a long-term energy supply for Ukraine.

The summit was an opportunity for Western nations to take a step in the right direction by promoting the alternatives to nuclear power for Ukraine. Unfortunately, despite expectations, this opportunity passed with no significant progress to firm up planning for a safe, sustainable energy strategy for Ukraine.

In fact, as far as civil nuclear problems go, the summit represents a dangerous step backwards, with the final communiqué stating that existing reactors which do not meet modern safety standards should be upgraded rather than shut down.

This is a complete reversal of the G7's previous position. The 1994 Rome summit's final declaration included a commitment "to the existing international initiatives to promote an early closure of high risk reactors", thus emphasising that the old Soviet-designed reactors are beyond repair and should be closed. These include the RBMK (Chernobyl) type. This was emphasised by the radioactive release at the Chernobyl power station just hours short of the 10th anniversary of the disaster, showing up the continuing inadequate safety culture at that plant.

The lobbying power of the Western nuclear construction industry, at a standstill in the domestic market and eager to expand into eastern Europe, weighs heavily in the balance. Propping

up the flagging nuclear construction industry should not figure in negotiations over Western aid to Ukraine.

Disingenuously, the summit attempted to disguise the dangers of prolonging the nuclear option: the use of environmentally-friendly slogans such as "sustainable nuclear safety" in the context of 'bolt-on' upgrades is an irresponsible semantic game. Upgrading, however termed, is the path to facile agreement and perhaps to another disaster.

Economic and safety indicators point the alternative route — Ukraine's future does not have to be nuclear.

The three countries worst affected by the Chernobyl disaster — Ukraine, Belarus and Russia — have in the past decade undergone massive socio-political change, with a negative effect on their economies. The additional economic burden placed upon them by the accident is so great that they "do not have the capacity to face up to the enormous costs of remedying Chernobyl on their own".⁽¹⁾ Ukraine estimates that it would have to spend 20% of its national budget to cope with the consequences of Chernobyl, but is only able to allocate 4%.⁽²⁾ Well-directed foreign investment is therefore crucial to help with the socio-economic restoration of Ukraine.

In the December 1995 Memorandum of Understanding (MOU) the European Union and the G7 nations recognised an obligation to assist Ukraine. The deal set out is a package of grants and loans split broadly into two parts: one dealing with closing the remaining 2 Chernobyl reactors by the year 2000 and providing replacement electricity capacity; the other concerned with developing a sound long-term energy sector strategy, crucial to the recovery of the national economy.

Options for replacement capacity must meet "least-cost" planning criteria. Currently, the G7 views such least-cost investments as the completion of two nuclear power stations, Khmelnytsky 2 and Rovno 4.

However, it is not yet known what the cost will be of completing the reactors to a safety standard acceptable to Western governments. As part of the preparation for the MOU, the European Bank for Reconstruction and Development commissioned a study from Lahmeyer International: Ukraine Power Sector Least Cost Investment Plan and Training Programme.

It is estimated that completion would cost US\$871 million. The latest cost estimate now stands at US\$1 billion.⁽³⁾



Greenpeace delivers 260,000 postcards to the Ukrainian President calling for Chernobyl's closure.

Even at current estimates the Khmelnytsky/Rovno project cannot meet the least-cost criterion when compared with the many low or no-cost energy efficiency measures under development.⁽⁴⁾

The G7 has recognised the link between a rational energy industry, energy efficiency and regenerating the Ukrainian economy. However, Ukraine's position if the current terms of the MOU are adhered to is a difficult one.

If the loans set out in the MOU are to be repaid, the newly created generating companies must be able to earn enough to pay back the loans. This means that they will have to charge realistic market prices, pushing up prices in the energy-inefficient industrial sector. In the current economic climate in Ukraine, the most realistic way to ensure that repayment occurs is by investing in energy efficiency to reduce electricity consumption, so allowing the potential to generate repayment revenue.

Efficiency & renewables

In early April 1996 Greenpeace published a survey of the potential for energy efficiency and alternative energy projects in Ukraine.*

The report found that Ukraine's potential for energy saving is so great that implementation would far outweigh the need for any nuclear-generated supply: the State Committee for Energy Conservation has stated that "Ukraine ... disposes of a huge (about 40% or 80 million tons oil equivalent) energy saving potential."⁽⁵⁾ Ukraine's total nuclear-generated electricity in 1995 amounted to 70.5 terawatt hours (TWh),⁽⁶⁾ 18.3 million tons oil equivalent.

- Energy efficiency studies show that up to 14TWh could be saved at a cost of US\$0.03/kWh.⁽⁷⁾ This is more electricity than the 11.67TWh produced by the 2 remaining Chernobyl reactors in 1995.⁽⁸⁾
- At a cost of US\$905 million, at 7 industrial sites within a 5 year period, capacity saved by demand side management and load management could approach 4,000MW.⁽⁹⁾ The capacity of a VVER-1000 reactor such as those planned for Khmelnytsky and Rovno is 1,000MW; Chernobyl's 2 remaining reactors have a combined capacity of 1,800MW. This single energy efficiency project could therefore replace the equivalent installed capacity of these 4 nuclear reactors at less expense than projected completion costs for Khmelnytsky and Rovno.
- Providing replacement capacity for Chernobyl could be achieved using a combination of energy conservation and renewable energy options within 18 months.⁽⁸⁾
- Nearly 4,000 MW of renewable energy could be brought on-line in the next 5 years.⁽⁸⁾

In the longer term Ukraine has great potential for renewable energy: wind power, solar power and hydro-electricity. It is estimated that wind power has the potential to supplant up to 40% of the electricity now produced by Ukrainian nuclear power plants.⁽⁸⁾

Ukraine is one of the most energy-intensive economies in the world, a problem exacerbated by the historic underpricing of energy to consumers which has done nothing to encourage energy efficiency. Opportunities for cost-effective energy saving are undisputed; without foreign investment many of these projects will not get beyond the pilot stage. It is in the best interests of the environment and the economy that the substantial Western investment currently targeted for nuclear power in Ukraine be transferred to energy efficiency measures.

Ten years on, safety and waste disposal concerns have not diminished, land use is still restricted as far away as the UK and millions of lives are still overshadowed by the accident. Continuing reliance on nuclear power inevitably gambles with the chances of another Chernobyl-scale disaster.

If Ukraine is to develop a stable economy which can compete in the world market, consumption of energy must be reduced. The G7 has the ability to provide the necessary capital and a possible framework to develop a sound long-term energy policy exists in the Memorandum of Understanding.

Despite John Major's report to the Commons that "energy efficiency and conservation have an important role to play" in reforming the Ukrainian energy sector via least-cost planning,⁽⁹⁾ neither the Moscow summit nor the preceding Vienna International Atomic Energy Agency conference paid more than lip service to this view.

Rather than developing the two projected nuclear power stations, a better electricity deal could be achieved for Ukraine by implementing low cost energy efficiency measures in the near term, and looking to renewable energy sources for the future. The non-nuclear option is viable and should be pursued vigorously. The nuclear option is expensive, dangerous, unsustainable and should not be pursued further.

MEPs recently voted by an overwhelming majority for the closure of high risk nuclear power stations like Chernobyl. They also stressed the importance of developing a genuine strategy to promote energy saving programmes.⁽¹⁰⁾

The British government still has a chance to respond to political opinion: G7 Environment Ministers meet in May preparatory to the G7 Lyon summit in June. This time, the opportunity to promote a non-nuclear approach to the closure of Chernobyl and the future of the Ukrainian energy sector should not be lost. □

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* For a copy of the Greenpeace report, *The Answer to Chernobyl: a survey of the potential for energy efficiency and alternative energy projects in Ukraine*, please contact Kate Muir at Greenpeace, Canonbury Villas, London N1 2PN or call 0171 865 8213.

Nuclear accident emergency planning:

Ten years on from the Chernobyl accident, Fred Barker looks at the lessons for UK emergency planning and outlines a Nuclear Free Local Authority consultation document on future measures.

FOLLOWING the unprecedented confusion and demand for information provoked by the Chernobyl disaster, the UK government ordered reviews of arrangements for dealing with overseas and domestic nuclear power station accidents. Ten years on, the National Steering Committee of Nuclear Free Local Authorities (NSC) has undertaken an examination of the legacy of these reviews. This has been done for two specific reasons: to explore how well prepared Britain is for a major nuclear accident; and to highlight points where discussion is needed in order to generate proposals for improvements.

The NSC's examination draws on a wealth of previously unpublished material, including the papers of the government's Nuclear Emergency Planning Liaison Group (NEPLG), exercise reports and a new survey of progress around major civil nuclear installations. It has been published as a consultation document⁽¹⁾ with a request for comments by the end of July. In addition to circulating the paper within the emergency planning community, the NSC is keen to stimulate wider discussion.

The NSC's starting point is that radiation emergencies have distinctive characteristics which need to be taken full account of in emergency arrangements. These characteristics are: the difficulties of identifying the scale and spread of the radiological hazard; the extent and nature of public anxiety and distress; and exceptional media coverage.

There are three main implications for emergency planners: an effective emergency response will be possible only if adequate attention has been paid to the organisational and technical infrastructure for detection, assessment, co-ordination, decision-making and information dissemination; mechanisms need to be developed to deal with the behavioural consequences of anxiety and distress, including spontaneous evacuation and a large number of telephone enquiries to official bodies; and the benefits of the media in providing information need to be maximised, whilst minimising the problems that can arise from the way it monitors and analyses unfolding events.

Overseas accidents

The NSC identifies a number of limitations and problems with the UK's National Response Plan (NRP). First of all, Rimnet — the network of radiation monitors that forms part of the NRP — is only intended to provide facilities for incident detection. The availability of a wide range of 'supplementary' data from other monitoring sources is therefore crucial to incident assessment. And the most recent exercise of the core functions of the NRP revealed serious difficulties relating to the use of the Central Database Facility (CDF), the preparation of briefing materials, the

distribution of information and a lack of training of key participants.

As a result, the NSC invites views on: whether sufficient supplementary data for incident assessment would be available from other government monitoring sources; if not, what steps should be taken to encourage the provision of supplementary data from other sources, such as local authorities; or whether, instead, Rimnet should include automated spectrometric monitors to provide key data for incident assessment.

Views are also invited on what measures should be prioritised to improve the organisational and technical infrastructure of the NRP. This includes whether the existing 'lead authority' system for information dissemination from the CDF is sufficiently developed to enable all local authorities to operate a local public information service and, if not, what further steps need to be taken.

Planning for UK accidents

In Britain, detailed planning is confined to small zones around the site (of 1-3 km radius). This approach is based on the concept of the 'reference accident', which is the worst accident considered to be "reasonably foreseeable" by the industry and its regulator. Since 1989, the NEPLG has been meeting to "identify, recognise and find solutions to common problems and decide how issues should be taken forward". There has been a disappointing level of progress to date.

- Despite official acknowledgement that arrangements for **alerting the public** "are not ideal", no national guidance has been produced and progress on developing new national arrangements has been slow and secretive. In the meantime, continued reliance is placed on traditional plans for personal notification by the police backed up with locally agreed arrangements for public announcements by local radio and TV.
- Despite expert advice that **sheltering** should be seen as a countermeasure in its own right, NEPLG guidance has reaffirmed that emphasis should continue to be placed on **pre-planned evacuation**. In addition, NEPLG guidance and local planning appears to take no account of the evidence that the public shows a marked propensity to spontaneous evacuation.
- In contrast, Department of Health (DoH) guidance⁽²⁾ has highlighted the effectiveness of **sheltering**, particularly in combination with the taking of **stable iodine** to block radioactive iodine from the thyroid. Despite this, there is increasing reliance on a combined evacuation/stable iodine response, and plans for the door-to-door distribution of stable iodine to a sheltering population are being abandoned.

time to get a grip!

across the country because of logistical difficulties. In the main, this appears not to have been compensated for by the pre-distribution of stable iodine to individual households within the Detailed Emergency Planning Zones (DEPZs). The recent acknowledgement by the National Radiological Protection Board that it may need to re-evaluate the policy and criteria for distribution and use of stable iodine in the light of the epidemic of Chernobyl childhood thyroid cases casts further doubts on the efficacy of current arrangements.

- Although some welcome changes have been made in arrangements for control and co-ordination of the off-site response — including a downgrading of the role of the operator — the persistent nature of the problems experienced in exercises raises concerns that it will be difficult to make the arrangements work effectively in practice.
- Plans for the co-ordination and direction of a significantly expanded emergency radiation monitoring effort are at a rudimentary stage. This could have serious implications for the effectiveness of incident assessment.
- Although some welcome changes in arrangements for briefing and dealing with the media have been made, problems still remain. First, there is a conflict of interest in the roles of the Government Technical Adviser, who is charged with providing independent advice on countermeasures at the same time as acting as the government's principal media spokesperson. Second, exercises persistently highlight problems with media briefing. Third, the media will be ruthless in appraisal of the emergency response, exposing any inadequacies to the glare of publicity.
- Finally, despite initiating a programme of work in 1992, the NEPLG has not yet produced any guidance on the longer-term measures of decontamination and clean-up. Progress in the preparation of guidance on this, and on the issue of relocation, has been very slow.

The NSC concludes that overall, although some progress has occurred, insufficient advances have been made to engender real confidence that an effective response to a reference accident could be mounted. As a result, it invites views on the steps that should be taken to improve arrangements.

In theory, a response to large-scale reactor accidents — more serious than the reference accident — should be available through the extendability of detailed plans. However, there are major problems with this notion.

First, an extended response can only be built on the detailed plans for a reference accident if these

plans are themselves fully developed and effective. The points above indicate that this has not yet been achieved. A specific example of the problems this can cause arises where there is an absence of arrangements for distributing stable iodine to a sheltering population. Second, although Nuclear Installations Inspectorate guidance⁽³⁾ provides a welcome shift away from a reliance on general contingency arrangements as the basis for an extended response, it fails to set out sufficiently clear and unambiguous advice on the requirements of outline planning beyond the DEPZ. Third, more recent NEPLG guidance⁽⁴⁾ takes the retrograde step of reasserting the view that general contingency plans should provide a framework for dealing with large-scale nuclear accidents.

As a result, even the most determined local authorities have had great difficulty in trying to ensure that extendability has the required real content in terms of outline planning and exercising. Overall, there is a marked lack of substance in planning for an extended response. Not surprisingly, the NSC concludes that Britain is ill-prepared for an accident more serious than the so-called reference accident.

In the light of this, the NSC invites views on: the approach that should be adopted for planning to deal with the consequences of large-scale accidents, with possibilities including outline planning for an extended response, placing reliance on general contingency plans, or significantly increasing the size of DEPZs; and, if outline planning for an extended response is favoured, what steps should be taken to ensure that this has real substance.

Demand for information

There is little doubt that there would be a large demand for public information in the event of another major nuclear accident. Although arrangements for disseminating information via the media could go some way to meeting the demand, there would still be a large number of public enquiries to official bodies. Unfortunately, proposals for developing effective local enquiry centres⁽⁵⁾ appear not to have been taken up in any significant way.

As a result, the NSC also invites views on the scope for supplementing and complementing the national emphasis on the role of the media by developing local telephone enquiry centres.

Despite the ten years that have elapsed since Chernobyl, it is clear that much remains to be done to bring arrangements for nuclear reactor accidents to an acceptable level of preparedness.

The NSC hopes that it can stimulate more concerted action. The circulation of its consultation document* is seen as a first step. This will be followed by the publication of an appraisal of the comments received. □

"There is little doubt that there would be a large demand for public information in the event of another major nuclear accident."

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*Copies of the document are available from the Nuclear Policy and Information Unit, Town Hall, Manchester M60 2LA. Tel 0161 234 3244 and Fax 0161 236 8864. Email: nfnzsc@gn.apc.org.

Solar hydrogen projects

As wind and solar power become more prevalent, the problems of balancing supply and demand will become increasingly important. Martin Bond looks at the possibility of using hydrogen as an energy carrier.

HYDROGEN has long been lauded as an answer to our energy problems. It can be produced from a cheap and abundant resource — water — while both its production and use are potentially non-polluting. Proponents envisage a future where hydrogen is used to generate electricity and replaces fossil fuels for transport, industry and the home. According to Nejat Veziroglu, president of the International Association for Hydrogen Energy, hydrogen is no less than "the permanent solution to the depletion of conventional fuels ... the permanent solution to global environmental problems."⁽¹⁾

Hydrogen's appeal derives from its elemental simplicity. With no carbon or sulphur present — unlike fossil fuels — it burns in air producing few environmentally harmful emissions. The main by-product is water vapour. The only pollutant is nitrogen oxide, emissions of which can be reduced to low levels. Better still, hydrogen can be used in a fuel cell where, combined with oxygen, it generates electricity with only water as 'waste' ("Unlocking the fuel cell's potential", SEJ76).

Current hydrogen production (for use in industry) is not environmentally friendly. Manufactured either from natural gas by steam reforming or by gasification of oil or coal, depletable resources are consumed and carbon dioxide released. But there is a green alternative: hydrogen can be produced by the electrolysis of water. If the electricity used to split water into hydrogen and oxygen is generated by fossil fuels or nuclear power the process will not be pollution free; but if electricity is obtained from renewable energy, hydrogen production will be clean and sustainable. For advocates of a 'hydrogen economy', the combination of renewable energy, electrolysis and fuel cells provides the ideal foundation.

Hydrogen could also be produced by nuclear electricity. In a post-fossil fuel world, hydrogen would enable the nuclear industry to supply

virtually all our energy requirements: liquid and gaseous fuels as well as baseload electricity. 'Hydrogen economy' is not therefore synonymous with solar hydrogen or renewable energy — but only hydrogen produced by renewable energy will be pollution-free.

The use of renewable energy to produce 'solar hydrogen' for domestic and transport purposes is illustrated by two projects in Germany.

Freiburg house

Freiburg is home to both the Fraunhofer Institute for Solar Energy and its Self-Sufficient Solar House (SSSH). Completed in 1992, the building's passive solar design, high standards of insulation and use of energy-efficient appliances combine to absorb solar heat, minimise heat losses and ensure low energy consumption. Mounted on the roof are 14m² of solar collectors to supply hot water and electricity is generated by 30m² of monocrystalline silicon photovoltaic cells. The electricity, with a peak output of 4.2kW, can be used directly or up to 20kWh can be stored in lead acid batteries to balance daily variations in supply and demand.

The SSSH goes one step further than other solar/low-energy houses: it aims for non-polluting energy self-sufficiency by relying totally on solar energy. This is achieved by producing hydrogen and oxygen from water in an electrolyser using electricity from the solar cells. In summer, when there is a surfeit of solar electricity, hydrogen and oxygen are generated and stored in tanks. During winter, if the solar cells' output is inadequate, electricity can be obtained by recombining the gases in a fuel cell. In this way, hydrogen provides a storage medium for solar energy thereby offsetting seasonal variations in insolation. Hydrogen is also used year-round in a catalytic cooking stove and to fuel a catalytic boiler for space heating in winter.

Neunburg vorm Wald

Another innovative project, near Neunburg vorm Wald, is a far larger operation. Amid the wooded hills of north-eastern Bavaria, almost 3,000m² of photovoltaic cells supply electricity to two electrolysers which can produce up to 50,000m³ of hydrogen per year. The project has been developed and operated by Solar-Wasserstoff-Bayern (SWB), set up for the purpose by several German companies with interests in the technologies involved. BMW, Bayernwerk, Linde, Siemens and DASA (formerly AEG) are all shareholders in the company.

Like the Freiburg house, it makes no claims for commercial viability, concentrating instead on gaining practical experience at utilising hydrogen

Filling car with Hydrogen, Neunburg vorm Wald.



Photo: Martin Bond

from solar electricity. At Neunburg, hydrogen is used to fuel gas heating boilers (for site use) and electricity is produced by two fuel cells — one, a phosphorous fuel cell of 80kWe, is the only one of its kind in Europe.

The project also includes a filling station for hydrogen-fuelled vehicles. Hydrogen fuel offers the promise of zero or reduced vehicle emissions, depending on the type of engine. Electric vehicles powered by fuel cells produce only water vapour, internal combustion engines can, with modification, also run on hydrogen but will emit nitrogen oxides as well as water vapour.

With both types of engine, the handling and storage of hydrogen fuel — which at normal temperature and pressure is a gas — present considerable problems. The most viable storage options are as a liquid in tanks, as a pressurised gas in cylinders, or as a solid in the form of metal hydride. During the 1980s, Daimler Benz adapted ten Berlin taxis and delivery vans to run using hydrogen stored in metal hydride. In contrast, SWB have opted for liquid hydrogen which has the advantage of a higher energy content per unit volume than other forms of storage.

Unfortunately, hydrogen must be cooled to -253 degrees C before it becomes a liquid and special pumps and refrigeration equipment are required for vehicle refuelling. Using a modified BMW car, the practicalities of 'filling up' with a cryogenic (very low temperature) fuel have been an important part of the project. Refuelling time, for example, has been reduced from one hour to five minutes.

In fact, the filling station has not used hydrogen produced on site to avoid the cost of installing a liquefaction unit. It currently relies on liquefied supplies from a commercial producer, an arrangement which reflects an economic handicap of solar hydrogen: electrolysis of water is a far more expensive way of producing the gas than obtaining it from fossil fuels. While SWB buys in hydrogen made from methane at 2DM per litre, solar hydrogen produced on site costs thirty times as much.

The future

Solar hydrogen is becoming a reality, at least in small experimental projects, including several European countries, the United States of America, Saudi Arabia and Japan. For the long term, hydrogen is seen as a replacement for natural gas, a well established fuel — increasingly used in vehicles — whose distribution infrastructure might be adopted for hydrogen.

Progress will depend on various factors. Recent enthusiasm has been stimulated by predictions that the cost of manufacturing solar cells will decrease substantially. A breakthrough in the economics of solar electricity would be a major incentive, as would political initiatives like California's zero emission vehicle legislation. Various motor manufacturers are pursuing

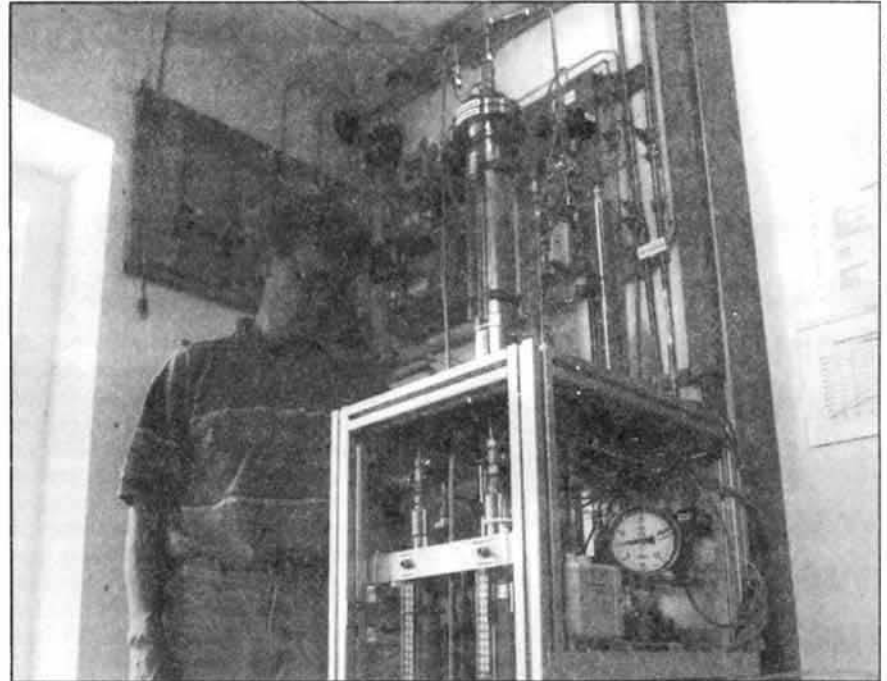


Photo: Martin Bond

Electrolyser unit, Freiburg

research on hydrogen-fuelled vehicles, although mostly using modified internal combustion engines. For truly clean hydrogen transport, much will depend upon the further development of fuel cells.

The availability of land and sunshine is also important. It has been estimated that hydrogen equivalent to total world fossil fuel consumption could be produced on 530,000km² of arid lands — less than 2% of the world's deserts.⁽²⁾ Producing sufficient hydrogen to replace US consumption of oil, gas and coal would require an area equivalent to a third of New Mexico.⁽²⁾

While America may have abundant land and sun, solar hydrogen's prospects in small countries with weather like Britain's might be viewed with pessimism. However, hydrogen's crucial advantage is that it is an energy carrier — it provides a way of storing and supplying energy from intermittent renewable sources. Thus, while hydrogen might be produced by wind farms in Wales or solar cells in the Sahara, it could be consumed wherever it could be supplied. One of the most ambitious schemes to date, the Euro-Quebec Hydro-Hydrogen Project, aims to show how hydroelectricity in Canada could produce hydrogen for export to Europe.

If hydrogen is a key to a renewable future, the German projects above exemplify different approaches. The SSSH, a model for the decent-ralised self sufficiency through storage of renewable energy, versus Neunburg vorm Wald, prototype for an international large-scale industry supplying a fossil fuel replacement to keep the motorways moving. These may not be mutually exclusive possibilities, but they do point to wider issues about energy policy. The geopolitical implications of a global hydrogen economy — where the multinationals or sunny North Africa become major suppliers of hydrogen — will need to be discussed if we go down the hydrogen road. □

"Hydrogen equivalent to total world fossil fuel consumption could be produced on less than 2% of the world's deserts."

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Plutonium: piling up problems

As the use of plutonium from dismantled nuclear warheads for nuclear reactor fuel gains wider political support, in the first of two articles Shaun Burnie summarises the current global plutonium crisis.

WHAT should be done with the emerging stocks of nuclear weapons material — plutonium and highly enriched uranium? This was discussed at April's Moscow Nuclear Safety Summit, attended by leaders of the G7 (group of seven nations) and Russia, but not highlighted in the final communiqué.

Behind the scenes, the nuclear fuel cycle industry exploited the meeting hoping to enhance political support for the expansion of the plutonium economy. Not satisfied with creating the present global plutonium stockpile of over 100 tonnes in the commercial sector, the industry has moved rapidly in the past few years to present itself as part of the solution to the legacy of nuclear weapons production. Its answer is Mox — mixed plutonium and uranium oxide fuel. However, rather than leading the world away from nuclear confrontation, Mox production will increase and broaden the threat of nuclear proliferation.

World plutonium stockpiles amounted to about 375 tonnes at the end of 1993, around 120 tonnes of this was civilian (but still weapons-usable) plutonium, produced in commercial nuclear reactors and extracted from the spent fuel by reprocessing.

While military plutonium production has almost ceased, commercial plutonium stocks are rising. In 1995, more than 20 tonnes of plutonium came from reprocessing plants in the UK, Russia, France and Japan and by the year 2000, 'civilian' stocks of plutonium will be close to current military stocks (see Table 1). In the 1960s and '70s the nuclear industry in Europe and Japan argued that uranium resources would soon become scarce, affecting both the economics and the ability to operate uranium-fuelled reactors. Large resources were committed to the research and development of Fast Breeder Reactors (FBRs) which would produce power while also creating more plutonium (from uranium-238) than was

consumed as fuel. The initial plutonium fuel was to come from reprocessed Light Water Reactor (LWR) spent fuel, requiring the construction of large-scale reprocessing facilities.

The FBRs that were built, with few exceptions, have failed to operate successfully. France planned to operate six by 1985, only two are operating, at low power, with no plans for new reactors. Of 12 FBRs planned for the former Soviet Union, only three operate, with continual technical problems. The UK, US and Germany have closed their FBRs. Most recently, Japan's prototype FBR, Monju, suffered a significant sodium coolant leak ('Monju leak', SEJ108) late last year.

Despite the collapse of the FBR experiment, by the late-1970s large commercial contracts for reprocessing spent nuclear fuel had been signed with the UK and France and the construction of large-scale reprocessing plants went ahead, financed with billions of dollars from Japanese, German, UK, French, Swiss, Belgian and Dutch utilities. Confronted with large stocks of plutonium, utilities in these countries (with the exception of Spain and the Netherlands) have opted to use the plutonium as Mox fuel in their Pressurised Water Reactors (PWRs). However, its use is limited by significant political, nuclear safety, economic and environmental factors, and global stockpiles continue to grow.

Mox production

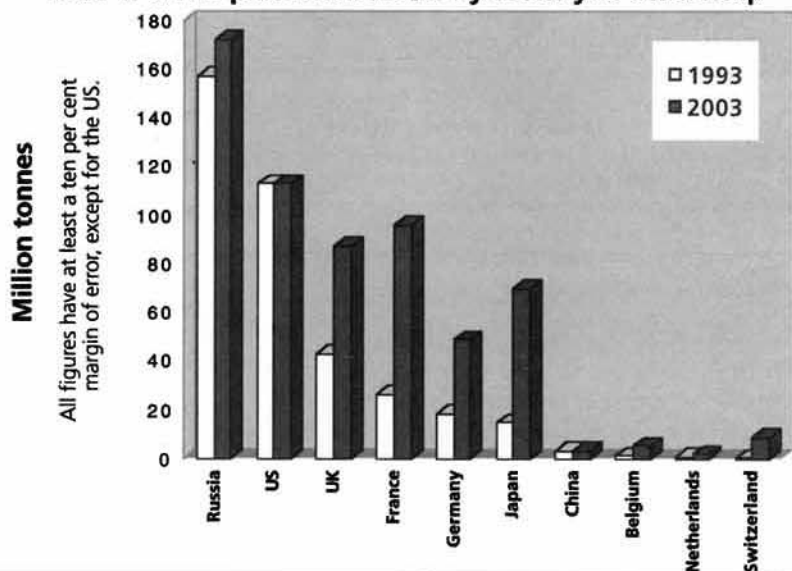
FRANCE: France currently has the world's largest commercial Mox production infrastructure. Although they are not designed for it, seven of Electricité de France's (EdF) 900 MW PWRs are using Mox, and another nine have also been granted licences.

Mox is fabricated at Cogema's Cadarache facility in southern France, which can produce 15 tonnes of heavy metal per year (tHM/y). Greenpeace has learnt that 50% of Mox production this year, and all 1997's capacity, will be used for German utilities. The 120 tonnes per year Mox plant, Melox, which began production in 1994, will produce fuel exclusively for EdF which intends to use Mox in 28 reactors.

Total annual plutonium consumption for both Mox facilities is optimistically estimated to be over 10 tonnes, but even this would leave EdF a surplus of more than 38 tonnes of plutonium by the year 2000.

UNITED KINGDOM: There is no domestic demand for plutonium in the UK beyond that required for weapons. Contracts with the main commercial reprocessing plant, Thorp, are split between domestic and overseas customers. Over half the first ten years' capacity is covered by contracts with Germany, Japan, Italy, and the Netherlands, Spain and Switzerland. By 2003/4, up to 47 tonnes of plutonium will be separated, 41 tonnes for overseas clients. Thorp's operator, the state-owned British Nuclear Fuels (BNF), hopes to supply Mox on completion of the

Table 1: World plutonium stocks by country of ownership



Sellafield Mox Plant (SMP). It is expected that at least some of the 120tHM/y capacity will be available by late 1997/8. However, the SMP has contracts for less than 20% of its first ten years' capacity: around 200 tonnes of Mox for Germany and around 10 tonnes for Kansai Electric Power/Mitsubishi of Japan. BNF's earlier expectations that large contracts with Japan were inevitable have been dealt a severe blow by the Monju accident.

JAPAN: Japan has the most ambitious plutonium programme, and is one of the few countries still publicly committed to the commercial development of the FBR. However, their programme, like all others, has been seriously affected by political, environmental, economic and technical problems. Public and political confidence in the ability of Japanese industry to safely manage plutonium has been shattered.

The Monju prototype FBR began operation in April 1994, but following last year's accident, it is unlikely to operate again much before 2000. Planned construction of the follow-on demonstration FBR has slipped to early next year and could, following the Monju accident, be delayed further. One other FBR (Joyo) remains in operation.

Operation of the large-scale Rokkasho-mura reprocessing facility which will separate up to 6-7 tonnes of plutonium annually, will now not begin until around 2004/5. Due to strong opposition to the transport of 1.7 tonnes of plutonium oxide from France to Japan in 1992/3, utilities are now believed to be considering transportation of Mox fuel from Europe, in the belief that it will create less opposition.

Japan's plutonium stocks, 15 tonnes in 1993, could grow to 70 tonnes by 2003, depending on completion of Japanese utilities' first-decade reprocessing contracts with the UK and France. How much will be transported back to Japan and how much will remain in Europe remains unclear.

The Monju accident has affected plans to use Mox fuel in up to 12 LWRs by early next century. Three prefecture (regional) governors have issued statements opposing the licensing of Mox use in LWRs unless certain conditions are met. It is possible that there will be no Mox use in LWRs before the year 2000.

Plutonium supply greatly exceeds demand, and by 2010 Japan will have a total stock of around 110-113 tonnes. Even in the optimistic demand projections of the Japanese government, as much as 85 tonnes of this will be surplus to requirements.

GERMANY: German reprocessing contracts with La Hague and Thorp over the next ten years will increase the country's stock to 49 tonnes. The lack of domestic demand for FBRs led to the adoption of Mox for LWRs and BWRs (Boiling Water Reactors). However, there has been much less Mox use than anticipated.

Germany has had no available domestic Mox capacity, since operation of a now abandoned Siemens plant at Hanau was suspended in 1991. A larger uncompleted Mox facility at Hanau, which cost almost US\$1 billion, was abandoned in December 1995. As at March 1995, 11 reactors were licensed to use Mox, but only five did so. A

12 tonne German plutonium stockpile at La Hague, will soon be added to by reprocessing at Thorp.

BELGIUM: Belgium has reprocessing contracts with Cogema, yielding over 5 tonnes of plutonium by 2003. Belgium's plutonium programme is an example of over-supply, with demand not expected to exceed 0.3 tonnes annually this century, generating an excess stockpile of almost 4 tonnes by the year 2003. It will take a further 13 years to consume this plutonium in Belgium reactors.

RUSSIA: Commercial reprocessing is centred at the Radiochemical Combine Mayak site at Chelyabinsk-40, now renamed Ozersk. A 600tHM/y reprocessing plant, RT-1, has operated since 1976, when it was converted from military production. Annual throughput of VVER-440 reactor fuel has averaged around 190 tonnes, recent reports suggest a decline to 100 tonnes. Around 27 tonnes of plutonium were produced by 1995. There is almost no domestic plutonium demand. The Russian FBR programme is centred around BN-600 at Beloyarskaya, it uses highly enriched uranium (HEU) fuel. Plans for three BN-800 FBRs using Mox remain unrealised.

There are plans to complete the unfinished reprocessing facility at Krasnoyarsk26. Construction was halted in the mid-1980s, following local opposition and financial restrictions from central government. If ever built, it is intended to reprocess 1,500tHM/y of fuel, from Russian VVER-1000s and overseas clients. Discussions have been held with utilities from countries including the Republic of Korea, Switzerland, Ukraine, and Taiwan, but no contracts exist.

A more immediate problem, in terms of commercial plutonium use, is an option under consideration by the Ministry of Atomic Energy (Minatom) to convert dismantled nuclear warhead plutonium into Mox. A study is underway on construction of a 20tHM/y Mox plant at Chelyabinsk, based on Siemens technology. Only 22 of Russia's largest reactors are theoretically capable of handling Mox: eleven are RBMKs — Mox use would compound their already dangerous operating characteristics.

SWITZERLAND: By 2003/4, Switzerland will have acquired a stock of 9 tonnes of plutonium, through French and British contracts. Despite plans for Mox use in all five of its reactors by 1998, doubts amongst utilities over the economic penalties of plutonium fuel use have contributed to delays. Mox supplied from Belgium, the UK and France is used in two small PWRs.

Conclusion

If reprocessing and Mox production proceed unheeded, early next century global plutonium stocks in the commercial sector will overtake the current military stocks produced during the Cold war. The unique safety, technical, economic and political problems posed by commercial weapons-usable plutonium programmes worldwide should not be underestimated. Added to this is the emerging threat posed by the so-called Mox solution for ex-military plutonium. □

"If reprocessing and Mox production proceed unheeded, early next century global plutonium stocks in the commercial sector will overtake the current military stocks produced during the Cold war."

Shaun Burnie is a Greenpeace International campaigner working on proliferation and security aspects of the nuclear fuel cycle.

In the next issue of The Safe Energy Journal, Shaun Burnie will consider the problems of plutonium use in the commercial sector, including the so-called Mox solution for ex-military plutonium.

Renewable energy advice centre

Many households have benefitted from the energy efficiency advice offered by local energy advice centres; Ben Oubridge reports on the aims of the UK's first local advice centre for renewable energy.

RENEWABLES have considerable potential to meet the community's energy demands. However, technical, legal, institutional, economic and environmental constraints are impeding the deployment of these technologies and their commercialisation. So says the European Union's Altener information booklet.

The Altener programme is an attempt to overcome these constraints through the promotion of renewable energy. It offers support to projects which strive to further integrate renewables into the established power generation industry, those that investigate financial and economic measures to increase the take-up of renewables and finally, projects which aim to give information and advice to all sectors of the community; prospective developers, local authorities, investors, architects, builders and, of course, the general public. One such project is the South Midlands Renewable Energy Advice Centre (SMREAC)

SMREAC was launched in February 1996 by The National Energy Foundation, an independent charity perhaps better known for its work in the field of energy efficiency including the development of the National Home Energy Rating scheme.

Run from the Foundation's offices in Milton Keynes, SMREAC is believed to be the first centre of its kind in Europe, dedicated solely to the promotion of renewable energy to all sectors of the community. It offers free, impartial advice to all those with an interest in renewable energy in the South Midlands area. In the past, the traditional source for such information has been the Energy Technology Support Unit (Etsu). However, Etsu has increasingly concentrated its efforts on realising the potential of the renewables being developed under the government's research programme rather than promoting renewables to the wider audience. On a local scale at least, SMREAC is attempting to fill this gap. In its early stages, the centre has encountered enquiries from four main categories of people:

- members of the public who have heard about renewable energy, but who want to be better informed about the subject in general, or wish to satisfy their curiosity about a particular technology;
- businesses who see a commercial opportunity in developing a renewable energy project, in particular through the Non Fossil Fuel Obligation (Nffo);
- individuals or organisations who wish to incorporate small scale renewable energy projects into their property;

- students who are covering renewable energy in their schoolwork or further; and
- higher education courses.

A noticeable trend in this country is for renewable energy consumers to be divided into two market sectors: those who see renewable energy as a potential market which could be very profitable; and those who regard renewable energy as a possible solution to a problem.

The former is largely made up of existing companies who see the opportunity to extend their current activities by generating electricity for the grid, usually under the Nffo. A good example in the South Midlands is Shanks and McEwan who have extended their traditional waste disposal business to include electricity generation from landfill gas. These large private firms usually have the resources to use consultancies and are proposing projects large enough to cover the overheads associated with a Nffo contract. The latter group is made up largely of individuals or small organisations who either have no existing electricity supply and who see renewables as a cost effective way to solve this, or who make a conscious effort to use renewables for purely environmental or educational reasons. Often, these people have very tight budgets and only wish to establish a small scale system to satisfy their own power needs. In such cases, there is very little help available.

Enthusiasm

SMREAC is discovering that there is significant enthusiasm for renewable energy amongst individuals and small organisations. In this part of the country, there is not much call for wave power, but there is interest in photovoltaics, passive solar design, low-head hydro, small wind turbines, and a resurgence of popularity for solar water heaters. By giving basic technical assistance, information about suppliers and sources of finance and other services, SMREAC is helping to break down the barriers to getting more clean energy projects on line in this region.

One of the challenges faced by a centre like SMREAC is to allay misconceptions about renewable energy. Renewable energy is often perceived to be too expensive for individuals or small organisations to adopt and the technologies are not always perceived as clean and reliable. Often, people have unrealistic expectations about the ability of renewable energy technologies to provide energy solutions. Some will be over-enthusiastic: a wind turbine sited in my back garden will supply all the energy needs for my house. Others are overly pessimistic about renewables: there isn't enough sun in the UK for solar panels to work.

By providing specific examples and basic facts about the various technologies, SMREAC hopes to overcome the usual barriers to small-scale renewable energy development. As an independent non-profit-making organisation, clients can have the confidence that the advice they receive is completely impartial.

A key objective of SMREAC is to make people aware of the opportunities and potential pitfalls presented by renewable energy. It is important in an industry still made up of many small firms for buyers of products and services to get several quotes to ensure they are getting a competitive price. In addition, consulting the relevant local authority about possible sources of funds and local planning considerations is essential.

Local initiatives

There are a number of initiatives which are making small-scale renewables more feasible. Equity finance specifically for renewable energy projects is now available. In addition, SMREAC hears about specialist programmes and funds from other organisations which may be of assistance to smaller developers. Renewable energy supply companies are appearing that will buy and sell electricity from renewables projects outside of Nffo. Although limited to the above 100kW user market at present, such companies could eventually replace Nffo as a green market for electricity developers. Getting good advice about financing and presenting a new renewable energy project can be invaluable, since potential investors will have differing risk and return criteria for funding projects.

Local authorities are having to think more about their own impact on the environment. Local Agenda 21 creates huge opportunities for ordinary people to join forces and develop renewable energy projects to cut local carbon dioxide (CO₂) emissions. New-build housing presents cost savings opportunities for incorporating renewables compared with retrofit. Many local authorities need further persuasion that larger developments could benefit the local economy and create jobs. Some have never encountered renewables before, and may need guidance about the environmental impact of a proposal put to them.

Businesses can improve their image, save money and meet new legislation by adopting renewable energy measures. The new landfill tax could prove very costly for some businesses but there may be opportunities to save money by utilising waste to energy technologies like gasification or anaerobic digestion for heat and/or power production, either for the businesses own buildings or for sale to the grid. The food



From left to right: Richard Tinson, NEF Director; Eryl McNally MEP, Vice President of the European Forum for Renewable Energy Sources; Dr. Mary Archer, NEF Chairperson; Councillor Bruce Hardwick, Mayor of Milton Keynes and Gareth Ellis, Manager of SMREAC, pictured at the launch of the South Midlands Renewable Energy Advice Centre in February 1996.

processing industry for example could make use of its waste products in this way.

One of the greatest challenges SMREAC faces is to make renewable energy relevant and interesting to the public and credible for professionals like engineers, architects and builders who will be called upon more and more to respond to the possibilities for renewable energy technologies.

Amazing progress has been made by initiatives to increase awareness and interest in energy efficiency. For example, there are over 30 Local Energy Advice Centres (Leacs) around the UK, giving advice on energy saving measures. They are able to use quick cost savings as an attraction. With typical payback periods of twenty years for a solar hot water system on the other hand, it is necessary to rely more heavily on environmental benefits and prestige of ownership to promote renewable energy measures. An important activity for SMREAC is being proactive and going out to responsive groups of people to inform them about renewable energy opportunities.

Global warming and fossil fuel resource depletion are now real threats. As more people wake up to the idea of renewable energy as a way to counter these threats, the infrastructure of the industry will need to be strong and supportive. SMREAC hopes that within the not too distant future, it will be just one of many such centres, offering support to an industry destined to become very competitive and successful. □

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Low-level radiation risks

Links between low-level radiation and cancers remains an area of much controversy with, for instance, leukaemia clusters near nuclear facilities still unexplained. Here, Dr Chris Busby presents his views on the health effects of low-level radiation.

MY thesis, and that of the Low Level Radiation Campaign, is that there is a major error in the present perception of risk from internal exposure to man-made fission products like Strontium-90 which first appeared in 1945 and because of weapons testing and nuclear power have been increasing ever since.

I am not alone in thinking this. I was at a symposium in the House of Commons recently together with Professor Ernest Sternglass presenting evidence that fission-product pollution was causing cancer and other serious illness all over the world. Also present were senior representatives of the National Radiological Protection Board (NRPB) and the Medical Research Council (MRC), concerned scientists and non-scientists, and even the Belarussian ambassador. The week before, Drs Rosalie Bertell and Jay Gould presented similar arguments in Vienna at an alternative meeting to the International Atomic Energy Agency conference on the radiation health effects of Chernobyl.

We argued that increases in cancer near nuclear sites, in atomic test veterans, in populations close to and distant from Chernobyl and indeed, a large fraction of the contemporary cancer increases we see everywhere can be explained with one theory ("Radiation and health reviewed", SEJ94). They can all be traced to effects of fission-products within the human body, substances whose hazard cannot be compared with natural background exposure and whose risks cannot be described by the studies of survivors of the Hiroshima bomb. Contemporary scientific belief disagrees. In order to avoid the obvious but unpalatable conclusion that we are all being systematically poisoned, we are encouraged to believe a whole range of quite different explanations for each observation: population mixing as the cause of Sellafield and

Dounreay leukaemias; that there are no increases in cancer in the atomic test veterans nor of leukaemia in children exposed to weapons testing fallout in the sixties; increases in areas of high rainfall, in Wales and Scotland, are because of better cancer registration or "mistakes"; increased ill health near Chernobyl was denied, then ascribed to "radiophobia" — and in the case of the 200-fold increase in thyroid cancer, originally denied and now being incorporated into the accepted risk assessment by re-evaluating upwards the thyroid doses.

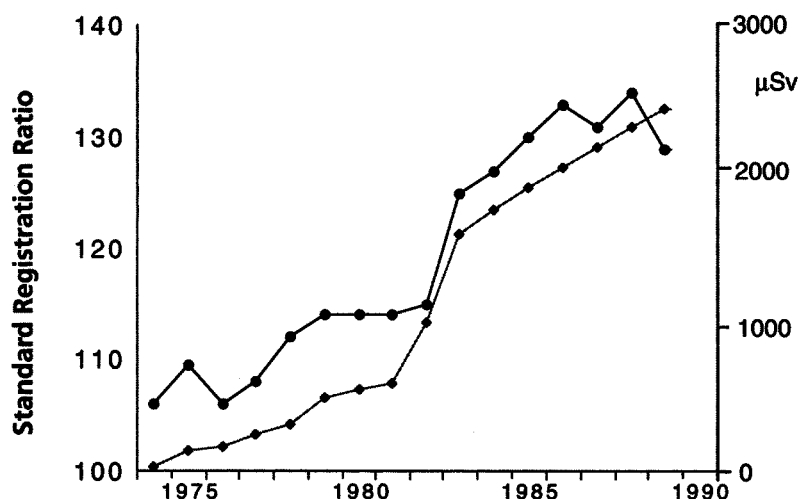
The story is told in my recent book, *Wings of death: nuclear pollution and human health*,⁽¹⁾ reviewed by David Sumner in *The Safe Energy Journal* 108. Sumner was rather hard on the book and our work. His own book, *Radiation risks*,⁽²⁾ an excellent primer, reads very cautiously, accepting the establishment view of radiation hazard. Like the establishment bibles (UNSCEAR and BEIR V) it does not mention the non-cancer effects found by Sternglass in the sixties, disagrees with the twenty-fold increase in risk factors for external radiation recalculated from the Hiroshima study by John Gofman and makes predictions for the Chernobyl health effects which fall well short of what is emerging.

I wrote my book to try and change beliefs among a wide range of readers and explain the science, the history and the politics of radiation risk assessment. I have received a great deal of good feedback. However, it has upset some medical experts, and experts in the area of radiation risk and epidemiology. Experts, of course, are those who know, have read all the books and accepted the model. It is these people we particularly want to address. Experts in the NRPB and MRC, and independent experts who advise the non-governmental organisations, are the gatekeepers of change in risk assessment, and are now the pivot on which the anti-nuclear agenda turns.

This movement began with a belief that man-made radiation was dangerous, even in small amounts. Why else did people oppose nuclear power and reprocessing? But since the fifties, and despite the early warnings of Nobel prize winners Linus Pauling and Andrei Sakharov, and the early evidence of Alice Stewart, Ernest Sternglass and others, the anger and energy of activists has been slowly deflected and baffled by scientific experts. Science has ridden to the rescue of the besieged nuclear wagon-train. The results of the Hiroshima A-bomb study were distorted to develop cancer risk factors showing that levels of fission-product exposure below natural background radiation cannot be harmful. This is now manifestly false.

According to Karl Popper, scientific beliefs survive by withstanding our determined efforts to refute them, distinguishing science from non-

Figure 1: All malignancy, Wales (Standard Registration Ratio; 1979 = 100); and cumulative dose from Sr-90 logged by 20 years



science.⁽³⁾ Popper's idea of the scientist as critic, challenging the existing view of the world, fits poorly with the structure of the scientific establishment and its funding since 1945. Neither state nor industry, the two establishments that fund radiation biology research, want to rock the boat: it is bad for business.

Alfred Russell Wallace, co-author with Darwin of the Theory of Evolution, stated: "My first great lesson into this enquiry was never to accept the disbelief of great men or their accusations of imposture as of any weight when opposed to the repeated observation of fact." Fact has increasingly and systematically challenged risk factors based on Hiroshima survivors and applied to low-level internal exposure from fission-products. Even the original Hiroshima data contained sufficient clues. The leukaemia rate in the control group, people not exposed to the bomb flash but only to fallout, increased to two to three times the Japanese average in the five years following the bomb.⁽⁴⁾ One mechanism which explains this and distinguishes between doses from many internal fission-product isotopes and external acute exposure is the Second Event theory.

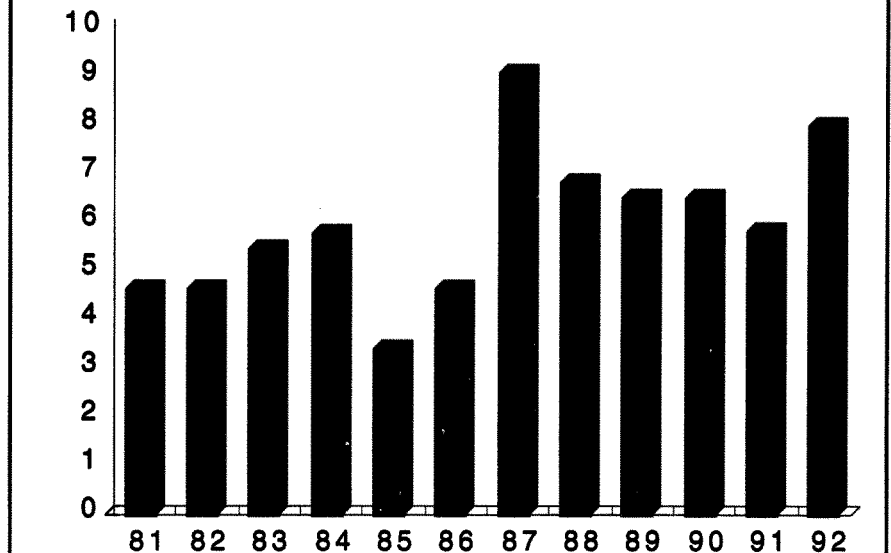
Sequentially decaying beta-emitters like the Strontium-90/Yttrium-90 series and the Tellurium-132/Iodine-132 series have an enhanced efficiency for mutation since they can decay within a cell, trigger a repair cycle in the cell and then produce a second decay attacking that repair cycle. The predictions of this theory are clear, specified and testable.

Strontium-90, which binds to chromosomes and is stored in bone, was a major component of the 1958-63 atmospheric weapons testing fallout and caused increases in infant mortality in areas of high exposure in Scotland and Wales at the time, and we argue caused the increases in cancer in those countries twenty years later. Trends in cumulative exposure to Sr-90 published by NRPB plotted alongside malignancy cancer incidence trends in Wales 20 years later achieve a correlation like that in Figure 1, which has a coefficient of correlation greater than 0.95! The great epidemiologist Bradford Hill would have no reason to dispute causality here: our theory and its predictions fit observation and satisfy his criteria.⁽⁴⁾ Other supporting evidence is described in *Wings of death*.

Sternglass is investigating Sr-90 as an immune system stress since its b- rays can reach the bone marrow from the depots of Sr-90 in bone. He gave many examples at the symposium, mostly from Jay Gould's forthcoming book, *The enemy within*, to be published in June. This book also discusses the many measurable effects of the Chernobyl fallout in the USA, including thyroid cancer increases in the USA following the accident, believed to be due to Iodine-131.

We ascribe the anomalous thyroid cancer increases in Belarus and elsewhere to another

Figure 2: Trends in lymphoid leukaemia rates age 0-4 years in Scotland per 100,000
Source: Scottish Cancer Registry



dangerous Second Event isotope, Tellurium-132, whose daughter Iodine-132 has a 2.3 hour half-life making it almost certain to decay into the Te-132 initiated repair cycle. This series was a major source of exposure from Chernobyl both in Belarus and Ukraine, and also in Scotland and Wales.

Chernobyl effects are rapidly becoming a major intrusion of reality into the risk assessors' wonderland. We have found such effects in Wales, low birth-weight babies, peri-natal and neo-natal mortality. The clearest example is the increase in childhood cancer and particularly lymphoid leukaemia in Wales, and also in Scotland. Data from the Wales Cancer Registry show 12 cases in 1990 compared with an average of 7.66 per year for 1984-88. In Scotland, the trend by year is available and is shown in Figure 2.

For those with an eye to conspiracy, and I am one, there is much food for thought. Anthony Tucker wrote in *The Guardian*⁽⁵⁾ of a complex system of cover-up and error that prevents any real overall assessment of the health fallout from Chernobyl becoming available. In Wales, the Cancer Registry has recently revised its four-fold excess bone cancer incidence out of existence and in the same breath announced that it is being shut down by the government and cancer registration being put in the hands of a private trust.

The Low Level Radiation Campaign will continue to publish the latest news and scientific findings in this important area in its quarterly magazine, *Radioactive Times*, and try to widen the cracks that are already appearing in the establishment assessment of the dangers of fission-products. There are some encouraging signs: talking recently, Prof. Dudley Goodhead, of the MRC, Harwell, did not rule out the Second Event hypothesis, he said it and its predictions should be tested. Dr Gerald Draper, at the Childhood Cancer Unit in Oxford, has not ruled out Chernobyl as the cause of the childhood cancer increases shown in Figure 2. What is needed now is an independently funded project to discover the truth and set ourselves, and our children, free. □

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Dr Chris Busby has published several research papers on low-level radiation and is the author of *Wings of Death* published last year.

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Electricity industry turmoil

CONFUSION reigns in the UK electricity supply industry as post-privatisation restructuring has run into a political quagmire. No-one now seems sure of the rules of the game, even the politicians.

Bids by the main generators National Power (NP) and PowerGen (PG) for regional electricity companies (recs), Southern Electric (£2.5bn) and Midlands Electricity (£1.9bn) respectively, were cleared by the Monopolies and Mergers Commission (MMC) only to be blocked by the President of the Board of Trade, Ian Lang. And despite clearance from the Takeover Panel for US utility Southern Company — which has already bought the south-west rec Sweb — to launch a bid for National Power, Lang's Department of Trade and Industry made clear that it would use its golden shares to block any takeover of National Power or PowerGen until there was increased competition in power generation in England and Wales.

Lang is not in principle opposed to recs being owned by generators having allowed the already vertically integrated Scottish Power to expand south of the border with the purchase of Manweb.

This whole episode reached the level of farce with an inquiry into the leaking of the MMC decision which focused on the electricity regulator Offer and the Office of Fair Trading; and the resignation of a senior member of the MMC over the watchdog's approval of the generators' bids despite its conclusion that they were against the public interest.

The blocking of NP and PG takeovers of recs has led the companies

to find other uses for their surplus cash. PG is looking outside the UK for possible acquisitions of up to £1.5 billion, and is considering the buying back of up to 10% of its share capital and increasing dividends; NP is planning a £1.4 billion dividend giveaway to its shareholders.

With PowerGen out of the picture, Midlands Electricity was the subject of interest from several US companies with Midlands finally accepting, subject to DTI approval, a £1.7 billion bid from General Public Utilities (GPU) and Cinergy. GPU of New Jersey is most famous as the owner of the Three Mile Island nuclear power station, and both companies have a history of losing costly battles with US regulators and consumer groups. Some analysts have suggested that the UK is attracting the least efficient US operators seeking a lightly regulated market place.

The UK-US conglomerate Hanson Group's sale of its 12.5% stake in the National Grid — acquired through its purchase of the rec Eastern Group — stirred things up in the City. The shares were bought by HSBC's broking arm James Capel which entered into a deal with Crescent Holdings, the buying vehicle of the Athens-based Olayan Group owned by a Saudi Arabian, Suliman Saleh Olayan, the world's 15th richest man. The arrangement between James Capel and Olayan is an underwriting of the purchase, with Olayan agreeing to share in any profit or loss from the purchase. Any further details of the arrangement have not been revealed, and if James Capel have a buyer lined up it isn't saying. Speculation in the City is that Hanson may still be involved with the

destination of the shares.

The timing and price for the sale has also led to speculation. The share price, 192.5p, was well below the valuation Hanson had previously estimated and less than that other brokers claim to have offered Hanson. However, with the electricity regulator due to announce a transmission price control review this summer, the shock waves from the heavy hand of the Gas regulator Clare Spottiswoode saw Grid shares dropping to 186.5p, giving Hanson a notional profit of £12.5 million on its deal within a couple of weeks of the sale.

Hanson — which recently announced its intention to demerge into four new companies, one of them covering its energy interests — has, through Eastern Group, spent around £1.7 billion on three of National Power's power stations, totalling 4,000MW. The purchase of a further two stations totalling 2,000MW from PowerGen has been delayed by PG's chief executive Ed Wallis because of the confusion in the market resulting from Lang's ad hoc rulings. The disposal of plant by NP and PG was forced on them by the electricity regulator Prof. Stephen Littlechild in an effort to increase market competition.

The effectiveness of the sale to Eastern in achieving this aim has been questioned by studies commissioned by the recs. Under the terms of the agreement between NP and Eastern, the sale price includes an output-related element. This, it is argued, will increase the marginal cost of operating the plant, forcing up the price at which it can bid into the pool, making it less likely that it could operate at low pool prices severely limiting the impact of the sale. □

Grid troubles

THE electricity system in southern England came close to collapse at around 10pm on 19 February 1996 it was revealed in May. A series of problems, most notably failure of the interconnector to France and the unavailability of First Hydro's pump storage plant in Wales, meant that the system frequency dropped to 49.03Hz, below the statutory minimum then increased to 50.45Hz before being brought under control. Although the incident lasted just a few minutes, thousands of electricity users narrowly escaped blackouts. Had the frequency dipped below 48.5Hz some CCGT (combined cycle gas turbine)

stations would have tripped automatically exacerbating the problem. This was the fourth time since last July that the Grid has been close to ordering blackouts, and for the first time in 15 years the number of "major events" has increased.

■ The National Grid Company had intended to ask the electricity regulator to allow a relaxation of its Operating Standards which would bring financial savings "with only a small increase in unreliability". The company has now decided that similar savings can be made in other ways. □

CHP boost

GOVERNMENT plans to make it easier for small local generators to sell their electricity to others is expected to boost the number of combined heat and power plants.

Under the proposed changes announced by energy minister Tim Eggar in April, generators will be able to supply up to 100MW to industrial and commercial customers on the same site and up to 1MW to local domestic customers. This avoids the need to trade through the pool and pay for notional transmission costs and, if appropriate, the fossil fuel levy. □

European Union carbon worries

DESPITE growing evidence of the need for action on climate change, the European Union (EU) is in danger of failing to meet its modest target of carbon dioxide (CO₂) stabilisation by the year 2000.

Last year was the hottest on record according to a UN report published at the end of April. The study, by the World Meteorological Organisation estimated a global mean surface temperature for 1995 0.4 degrees C above the 1961-90 average. Nine of the ten hottest years since records were first kept in 1860 have now occurred since 1980.

This news comes on top of the gloomy picture painted by the Intergovernmental Panel on Climate Change (IPCC) which warned that global warming has already started ("Global climate change", SEJ108).

In a European Commission (EC) report published in March,* projections by individual Member States, when aggregated, suggest that the EU will have cut CO₂ emissions by 1% from 1990 levels by the end of the century, but the EC believes that an increase of 3% is likely and that it could be as much as 5%.

While welcoming an improvement in reporting by Member States since the first evaluation in 1993, the Commission considers that the information provided is still insufficient.

Figures show a reduction of 2.7% in CO₂ emissions from 1990 to 1994, but this was due in a large part to economic recession. Commenting on the report, Environment Commissioner Ritt Bjerregaard said "it is unsatisfactory that the decisive factor ... is whether the growth rate in our economies will meet our economic expectations or not."

Six Member States have indicated that their programmes are dependent on the much-delayed plan for an EU carbon/energy tax.

Figures from the Paris-based International Energy Agency (IEA), and compiled by the Association for the Conservation of Energy (ACE), paints an even bleaker picture on CO₂ emissions.

The IEA data, compiled using information from government energy and trade departments, shows an increase in emissions of around 10%.

ACE's director Andrew Warren believes the discrepancy is because "we are seeing optimism from the environment departments and realism from the energy ones."

The UK government remains confident "that the UK is well on target to meet and even surpass" the target. Provisional figures show CO₂ emissions having dropped from 158 million tonnes of carbon (MtC) in 1990 to 149MtC in 1994 and to 148MtC last year.

Percentage change in annual CO₂ emissions from 1990 to 2000

Country	EU	IEA
Austria	1	8
Belgium	-1	3
Denmark	-12	7
Finland	30	33
France	9	13
Germany	-13	-10
Greece	14	19
Ireland	20	25
Italy	3	6
Luxembourg	-24	-20
Netherlands	0	0
Portugal	36	36
Spain	21	23
Sweden	4	6
UK	-6	-2
All	-1	3

■ Environment secretary John Gummer has released a set of 118 indicators for sustainability in the UK which aim to inform government, industry, non-governmental organisations (NGOs) and the public. The initiative is in response to commitments made at the 1992 Rio Earth Summit. Amongst the most worrying statistics are an increase in domestic energy use of 20% since the 1970s and a near doubling in car travel since 1970.

Gummer's indicators were given a guarded welcome by the Green Gauge grouping of environmental organisations which simultaneously launched its own, much more tightly focused, set of indicators on the state of the UK environment which show that the UK's environment is getting worse not better.

Meanwhile, the UK Round Table on Sustainable Development, produced its first annual report in April. The group, co-chaired by Gummer, has a membership "drawn widely from different sectors of society", and was "set up to seek consensus on major issues of sustainable development". The Round Table has come in for criticism over the lack of progress in its first year, and its members accept that the coming year will be crucial in demonstrating its effectiveness.

The group has produced reports on transport, energy and environmental mechanisms, but only the domestic energy market has been looked at in any detail. □

* Second evaluation of national programmes under the monitoring mechanism of community CO₂ and other greenhouse gas emissions" COM(96)91; EC 14 March 1996.

Emissions controls

NEW pollution targets for National Power and PowerGen were issued by HM Inspectorate of Pollution (HMIP) at the end of March.

The guidelines, which include company-wide and individual power station limits, set targets for reducing sulphur dioxide emissions from 1991 levels of 53% by 1999, 79% by 2001 and 85% by 2005. Oxides of nitrogen (NO_x) should be cut 35% by 2001 and 47% by 2005, while particulate emissions will reduce by more than half by 2001.

The targets, which also apply to the 6,000MW of plant being sold off/leased by the two generators, will keep the UK well within EU restrictions,

according to the government.

The new Scottish Environment Protection Agency, set up in April this year and which includes the former HM Industrial Pollution Inspectorate, has not yet announced any plans to set emissions targets similar to those in England and Wales.

National Power (NP) and PowerGen, the country's largest electricity utilities, said they were prepared for the new pollution limits.

Since privatisation, NP has invested £1.5bn in cleaner plant, and commented: "The limits are not expected unduly to inhibit our ability to operate our plant in a flexible commercial way." □

Orimulsion

PLANS by National Power to burn orimulsion — a dirty tar-like fuel from Venezuela — at its Pembroke Power Station have been strongly criticised by Friends of the Earth (FoE).

In the wake of the Sea Empress oil spill, the new Pembrokeshire County Council is to consider, in June, a planning application from Milford Haven Port Authority for construction of a jetty for importing the fuel and exporting waste. If rejected, a public inquiry could follow.

The Welsh CBI has called for the orimulsion plan to be given a fair hearing unprejudiced by the Sea Empress accident. But FoE Cymru argues that "the Sea Empress disaster showed that port safety and anti-pollution measures at Milford Haven are inadequate." □

Energy efficiency

A proposed five-year budget of Ecu150m for the European Union's (EU) energy efficiency programme Save II was slashed by the Council of Ministers to Ecu45m (£57m) at an Energy Council meeting on 7 May. The gathering of national energy ministers was dominated by plans to liberalise energy markets ("EU markets", below).

Although the ministers agreed to review the budget after two years, the cutback has been criticised by the European Commission (EC), MEPs and most of the EU's smaller Member States. Green MEPs are seeking a doubling of the budget and the EC is so incensed at the ministers' decision that it is threatening to withdraw the proposals entirely, claiming that the new budget "is so low as to seriously put into question the achievement of the programme's objectives."

■ The European Parliament's Committee on Energy, Research and Technology (CERT) looks likely to support an EC proposed directive on 'integrated resource planning' for the

electricity and gas sectors. The majority of members support the proposal which aims to promote greater energy efficiency through demand-led planning techniques. CERT's rapporteur on the subject, Eryl McNally MEP (Labour, UK), while supporting the directive, wants to see its terms and purpose more clearly defined. □

UK efficiency moves

The government decision to cut £31m from the budget for home insulation grants on the same day as the Home Energy Conservation Act ("Home energy conservation bill", SEJ105) came into force in England and Wales — 1 April — was described as an "April fool" by energy charity NEA.

The Home Energy Conservation Act requires local authorities to identify the most effective energy efficiency measures for homes in their areas, likely to include loft insulation and draughtproofing, the measures for which grant funding is being cut.

The cut in funding for the Home Energy Efficiency Scheme represents the

clawback of a £30m increase in funding, to £102.5m, made by the Chancellor Kenneth Clark as he tried in vain to get an increase from 8% to 17.5% for VAT on domestic fuel through the House of Commons at the end of 1994.

■ From 1 April 1996 all domestic washing machines and tumble dryers manufactured in the UK must display an energy label giving details of energy consumption and an efficiency rating from A to G. The scheme, which was introduced a year earlier for domestic fridges and freezers, is part of the European Union Save programme.

■ The Energy Saving Trust (EST) has introduced a "£100 cashback" scheme* to encourage householders to install high-efficiency condensing boilers. The cashback level for the two-year scheme will be reviewed in November. EST plans for a simple label to promote energy efficient products has not yet been approved by the Department of Environment. □

* For further details phone 0345 023 005.

Renewables orders

BOTH north and south of the border, the government's renewable energy schemes look like being massively oversubscribed. The Non-Fossil Fuel Obligation fourth order in England and Wales (Nffo-4), which is expected to be for 400-500MW has attracted applications for 890 projects totalling 8,397MW declared net capacity. In Scotland 280 projects applied for grid connection quotations for the Scottish Renewables Obligation second order (SRO-2), compared to 190 applications for SRO-1 which was ten times oversubscribed, forcing an increase in the planned 30-40MW size of the order to 77MW. SRO-2 is intended to be for 70-80MW.

Both schemes are expected to award contracts in March 1997, the Scottish timetable having slipped from late 1996.

The second Nffo in Northern Ireland is due to be made soon. It is believed that bidders include around 30 wind energy projects at between 3.7 and 4.2p/kWh, with the average well below 4p.

Douglas McIlldoon, the electricity regulator in Northern Ireland, has responded to critics of the Nffo who argue that it is putting up the price of electricity. He has suggested, in a consultation document, that creating a

genuine market for renewable energy in Northern Ireland would allow customers to decide how much electricity should come from renewables.

■ Yorkshire Electricity has infuriated renewables developers in its area by making hefty charges for grid connection studies; in one case, £4,800 was quoted to carry out a study for a 10MW scheme. Other regional electricity companies are charging hundreds of pounds or less.

■ The Renewable Energy Company, Stroud, has become the first company to market electricity solely from renewable sources having been granted a second-tier supply licence by the electricity regulator Offer.

Initially it will serve industrial and commercial customers with demand in excess of 100kW, but is looking to move into the domestic market when it is opened up to competition in 1998. This coincides with the ending of contracts for renewables projects from Nffo-1 and 2.

■ Gloucestershire County Council has put out a call for tenders to supply its Shire Hall with electricity from renewable sources. The council aims to cut its carbon dioxide emissions by 30% and hopes to give a lead to other organisations in the county. □

EU market

DESPITE a bland communique after their Energy Council meeting on 7 May, European Union (EU) energy ministers remain deadlocked on plans to open up energy markets across the EU.

Germany and France are at the forefront of the eight-year saga over market liberalisation. France is keen to keep its state gas and electricity monopolies, and Germany, the main advocate of deregulation, was not prepared to accept a compromise proposal to open up a minimum of 25% of markets to competition.

EC energy commissioner Christos Papoutsis had been confident that a deal would be struck at the 7 May meeting, and some progress was made, but the key issue of how much of the market should be open to competition remains the major barrier to agreement.

■ Senior MEPs on the European Parliament energy committee have warned that a liberalised electricity market will cut energy prices, reducing interest in energy saving and increasing pollution. MEPs are also concerned that liberalisation will threaten the stability of small and isolated electricity systems such as those in Luxembourg and Ireland, and undermine public service obligations. □

Wind developments

Scottish planning

DESPITE a concerted campaign of opposition, two windfarms on adjacent sites at Helmsdale, Sutherland, were approved by Highland Regional Council in March; the applications are now with the Secretary State for Scotland, Michael Forsyth, for his consideration, and could go to public inquiry.

At the last planning committee meeting before local government reorganisation, councillors travelled to the site of the proposed turbines and, against the advice of the planning officer, voted 14 to 8 in favour of Micon UK's 20-turbine scheme at West Garty and by 12 to 7 for a 17-turbine proposal at Gartlymore from Renewable Energy Systems.

Last year Micon, a Danish-based company, announced a turbine manufacturing deal with ESL in Inverness for the UK and Irish market, is expected to create up to 100 jobs ("Windpower round-up", SEJ105).

■ National Wind Power's 17MW, 34-turbine project at Novar Estate, Easter Ross — the first wind farm to receive planning approval from Highland Regional Council, in December 1995 — was accepted by the Secretary of State in March without calling a public inquiry.

However, Forsyth has decided to 'call in' two other wind farm proposals, one on Islay and the other at Largie, Argyll, and they will probably go to public inquiry. The main concern is over the possible effect on Greenland white-fronted geese, despite studies by the developers which suggested there would be minimum impact. □

English wind

A review of current planning policy guidance has been called for by the Countryside Commission, a government quango which advises on countryside issues. The commission believes that too many wind farms are being built in or near designated areas and wants designated scenic areas and surrounding land to be no-go areas for wind turbines. It also wants the government to give guidance to local authorities on assessing the cumulative impact of separate schemes.

■ There has been little effect on birds living near the Blyth Harbour wind farm, Northumberland, according to a study commissioned by the Department of Trade and Industry.

Only 31 birds have been found to have collided directly with the nine machines in the first three years of operation.

■ National Wind Power (NWP) has withdrawn a planning application for a 44-turbine, 22MW wind farm at Flaith Hill, West Yorkshire. The controversial application — in Brontë country — was opposed by environmental groups including the World Wide Fund for Nature and Friends of the Earth, but NWP has not ruled out the possibility of making a fresh application for the site in future. □



NATIONAL WIND POWER

World progress

A massive increase in wind power use around the world is forecast in a report commissioned by the Danish Energy Agency. With current policies, Danish consultants BTMN Consult expect there to be 180,000MW of wind power by 2020 and if there is an increased commitment by governments because of environmental concerns, this figure could increase to 470,000MW.

By the year 2000, wind capacity is forecast to grow by 10,000MW from the 1994 level of 3,738MW.

■ Construction of the world's largest off-shore wind farm, consisting of 19 turbines each of 600kW, began this April in the Netherlands. The near-shore development is in the IJsselmeer inland sea, which is already home to four 500kW turbines.

The developer, Dutch electricity company Nuon, would rather have sited their turbines on one of the dykes in the area, but concern over damage to the structures means they are a no-go area even for signposts.

■ A white paper on energy policy produced by the Dutch government has suggested that there should be an upper limit on wind power development of around 2,000 to 2,500MW, about ten times the capacity currently installed. The Dutch Wind Association has responded by arguing for large-scale development of off-shore wind power up to 100km from the coast. □

Osprey delay

OSPREY 2, the planned successor to the ill-fated wave power device which broke-up during installation off Dounreay last year ("Wave power ups and downs", SEJ106), is unlikely to go to sea until next year.

Allan Thomson, managing director of the Osprey's developer Applied Research and Technology, had predicted a launch this summer, but design changes — to reduce production costs and increase the 2MW power output — and warranty approvals for insurance have caused delays.

It is also intended that Osprey 2's ballast tanks will be filled with concrete and water rather than sand, and the possibility of it being bolted to the sea bed is being considered. □

Biomass strategy

GOVERNMENT plans for developing biomass energy over the next five years have been set out in a new report.*

The strategy aims to give industry a clear indication of Government objectives for biomass and sets out a co-ordinated programme of research, development, technology transfer, and deployment of energy generation from biomass, building on work already carried out, with the co-operation of industry.

Four groups of biomass are considered in the report: solid fuels from crops, liquid fuels from crops, plant waste (from agriculture and forestry), and animal waste.

The potential for energy crops, is put at 30TWh/year, equivalent to 10% of

current electricity demand. Agriculture wastes, at a conservative estimate, could contribute about 2.8TWh/year.

■ Scotland's first landfill gas power station, at Greengairs, Lanarkshire, was officially opened in May.

The 2MW plant is the first of a two-phase project awarded a contract at the end of 1994 in the first Scottish Renewables order. The developer, Shanks & McEwan, which runs the landfill site, will use methane gas from the rotting organic material in the waste to fuel the power station. □

* "The national biomass energy strategy", Ministry of Agriculture, Fisheries and Food, March 1996.

European renewable energy policies

Renewable energy strategies for Europe — volume 1: foundations and context
by Michael Grubb

The Royal Institute of International Affairs
Energy and Environmental Programme,
1995, 195pp, £12.95.



It may appear to many that the renewables industry has not been enthusiastically supported by government, and even that the ultimate aim of policy has been to protect the already established energy industries. It is also evident that while the success of the variety of different mechanisms and strategies used to promote renewables has been dependent upon the resource base and existing infrastructure within each country, the most important factor has been the political commitment to renewables. This book provides an excellent assessment of the history and present status of these policies within Europe and the context in which they have been formed.

Concentrating primarily upon the European Commission and the countries within the European Union (EU), the book also makes reference to policy and the

potential for renewables in eastern Europe and the former Soviet Union. In reviewing policy towards research and development programmes, it widens its coverage to included the experiences of Japan and the USA.

The book appears to be written to an academic audience with an interest in energy policy, the effects of this policy and how it evolves. In so doing, it may appeal to the ever-growing number of people and organisations approaching the European Commission for project funding who would like some general background in order to feel more fluent with, for example,

the background to the Altener programme, or the most noteworthy examples of mechanisms used to stimulate the markets for renewables.

One of the main conclusions which I drew from the book is that it may be rural employment and agricultural reform which will be the most powerful impetus behind renewable energy developments in Europe. The pressing agricultural problems and the central role which agriculture has within the EU may actually provide the back-bone of political support for renewables, in addition to the role of specific energy and environment policies. It argues that renewables fit in well with existing EU social, structural and sustainability objectives, including employment goals, although it stresses that employment benefits may not be as great as some supporters of renewables are suggesting.

The book provides some very good analysis and what appears to be a balanced view of renewable energy policy, highlighting the criticisms which have been made by others, but seldom making its own. Future volumes in the series will include *Heat and biomass energy sources* and *Electricity systems and primary electricity sources*, and it will be interesting to see to whom they will be targeted.

John Green

Fleshing out Labour energy policy

10% of electricity from renewables by 2010: the nature, means, practicality and costs of achieving this target
by Dave Toke

Sera, 1996, 18pp, Free*

ENERGY policy is a strange beast — at least in the hands of the politicians. The Conservative government proudly admits that it doesn't have an energy programme; despite this, it has a commitment to have in place 1,500MW of new renewables by the end of the century — increasing renewables output to around 4% of total electricity generation.

The Labour Party's policy document *In trust for tomorrow* set a "target figure of 10% of UK electricity demand to be met from renewable sources by 2010 and 20% by 2025."

Dave Toke and Sera, the Socialist Environment and Resources Association, are to be congratulated for trying to put some flesh on these bones. With the author of *In trust for tomorrow*, Chris Smith MP, as Sera president, and amongst its members

John Battle MP, Labour's energy spokesperson, and Joan Ruddock MP, Smith's successor as shadow minister for environmental protection, Sera is certainly well placed to beef up Labour energy policy.

It must be said, however, that the briefing is, in the circumstances, more than a little disappointing. Toke is, in essence, offering no more than a modestly expanded and extended Non-Fossil Fuel Obligation. The assumption that a "vigorous energy efficiency programme" would do no better than stabilise electricity consumption up to 2010, also seems surprisingly unambitious.

My main criticism is that what should be a forward-looking document fails to see beyond the present subsidy mechanism or to offer alternatives to a market-led energy policy. No account is taken of the fact that wind and small-scale hydro power have seen generating costs fall to the point where, once they are fully credited for the cost benefits of localised generation, they are already competitive with fossil-fuelled and nuclear generation.

If we must have a market-based system, then the real issues for the future are ensuring that new renewables are given fair access to the marketplace, and that the

environmental costs of electricity generation are internalised.

In looking at the existing structure and present prices, the document deals only with the position in England and Wales. Scotland receives no more than a passing mention until the penultimate recommendation, where it is assumed that Scotland will make a greater per capita contribution to the UK renewables target. It seems all too often that authors on the "UK" electricity industry seem happy to ignore the very different structures in Scotland while staking a claim for its renewables resource. The Labour Party is, after all, proposing a Scottish Parliament with powers over many issues including energy.

Although I found this paper disappointing, against the background of Labour's present skeletal policy it does at least try to make the party face up to its policy target; but it raises more questions than it answers. Its weaknesses are perhaps a sign of just how far down the political agenda energy policy has slipped.

Graham Stein

* SAE to SERA, 11 Goodwin Street, London N4 3HQ.

Putting sustainability on the agenda

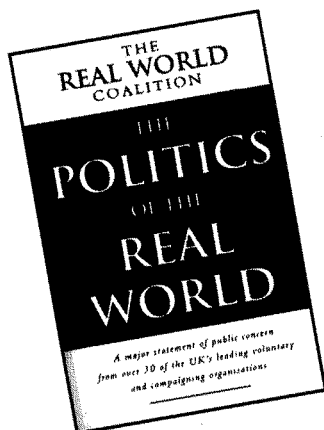
The politics of the real world

by Michael Jacobs,
The Real World Coalition.

Earthscan, 1996, 146pp, £6.99.

POVERTY and ecological destruction are linked, welded together at a fundamental level such that they cannot be resolved independently.

Real World is a coalition of 32 non-governmental organisations, including Friends of the Earth Scotland, "committed to raising the importance of environmental sustainability, social justice — including the relief and eradication of poverty, in this country and internationally — and democratic renewal in the UK political debate." It recognises the interconnections between the issues of environmental protection and social inequity and places them firmly in the political arena.



The idea that improvement in one field cannot be made without parallel improvements being made in others is not new, it has been expressed before — in 1987, the Bruntland Report commented that "a world in which poverty is endemic will always be prone to environmental disaster" — what is

new is that so many groups, representing over two million members, have come together to produce a joint statement. It is, however, perhaps surprising that it has taken so long for them to join forces in pursuit of common goals.

Its message is simple, our political system must be urgently reformed to allow it to adequately address both local and international issues of equity and ecological degradation.

Three years in the making, *The politics of the real world*, is aimed at the mainstream political parties. It is the centrepiece of a campaign to influence the agenda of the coming general election.

It is not possible to even scratch at the surface of the issues covered by the coalition in such a short review. Suffice to say this it is an extremely timely and important volume, it should be read and promoted by all involved in the energy and environment debate.

Mike Townsley

An insider's view of Sellafield

Inside Sellafield by Harold Bolter

Quartet Paperback, 1996, 298pp, £9.00

HAROLD BOLTON'S review of his life and times at British Nuclear Fuels (BNF) provides a readable account of battles fought inside and out to defend and promote Sellafield in the face of well founded public concern and suspicion. He admits he had the "toughest public relations task in Britain ... defending such deeply unpopular causes as the production of materials for the nuclear weapons programme, the discharge of radioactive materials into the Irish Sea and the use of the courts to fight compensation claims brought against BNF by families convinced that their children had died from leukaemia and other cancers caused by radiation from Sellafield." How could it be otherwise?

Entirely unrefereed and written in the first person, Bolter's style is opinionated and valedictory. It is his parting shot and after 14 years as BNF's longest-serving director, responsible for public information, security, political liaison and community relations, *Inside Sellafield* must stand as an authoritative, albeit selective and subjective, account of the plant's development.

Chapters span Sellafield's history; reprocessing and Thorp; waste management and disposal; Nirex's search for a disposal site; health and safety (apropos the

'Gardner theory'; battles with Greenpeace; battles with trade unions; and public relations — with the Sellafield Visitors Centre as the centrepiece. This is Bolter's legacy and monument to the notion of "an open and honest" policy for which he claims credit. Yet Bolter's memoirs are largely descriptive of events already on the public record. He certainly doesn't "Take the lid off Sellafield" as the publisher claims, but his account of the struggle to commission Thorp comes very close to it.

On page 88 Bolter writes: "I do not think Thorp would have been built if we had known 20 years ago what we know now." This seems a mite disingenuous given the objectors' case at the 1977 Windscale Inquiry. He also admits that it would have been far more difficult to obtain planning permission for Thorp if it were realised at the time that 70% of its work would be from overseas. In his view, the 'World's nuclear dustbin' label would have been far more difficult to argue against.

He recalls how, in early 1993, with Thorp complete, confidence in its viability began to crumble. The then new chairman, ex-Whitehall mandarin "Mr Guinness" (everyone else in the book is more informally addressed with their first name) took charge of putting Thorp's case to Ministers aided by spurious economic forecasts founded, so it seems, on guesstimates. Of the infamous Touche Ross report on the economics of Thorp, which BNF has consistently refused to publish,

Bolter writes "Whether Touche Ross would come to the same favourable conclusion about the economics of Thorp as it did in 1993 if it carried out the appraisal again today is open to question, as the figures fed into its study by BNF — and into the Whitehall exercise — have turned out to be incorrect in several important respects," (p84).

Sidelined by Guinness in 1993, Bolter found himself facing corruption allegations, police investigation and subsequent vindication, but too late to save his career. (Events which are recalled in a few closing pages.).

With Thorp running, Bolter doubts its ability to fulfil its targets. He also confirms BNF did not secure the high prices or amount of work it had expected for domestic reprocessing. Bolter concludes: "BNF will be hard pressed to find sufficient business to justify operating Thorp for a second ten years" despite the search for new business in Southeast Asia.

What is significant (and infuriating) about these confessions is that had "openness and honesty" really meant anything at the time to the BNF boardroom and the DTI with its privatisation agenda, it is much less likely that the judicial review in the High Court in 1994, of the justification for Thorp operation, would have found in BNF's favour. Thorp might have been stopped and another sorry chapter at Sellafield need not have been opened.

Stewart Kemp



Nuclear museum

The UK's first (and last?) PWR nuclear power station, Sizewell B, started operating only last year, but already it is museum material. The Science Museum in London, with financial support from the British Nuclear Industry Forum (BNIF), has installed a one-twentieth scale model of the PWR.

Neither organisation seems aware of the irony of the situation. A press release announcing the move declares: "The nuclear industry has seen tremendous developments since the Science Museum first opened its Nuclear Physics & Power gallery in 1982." That will be tremendous developments like ... the 1986 Chernobyl disaster?

Anyone considering a visit to the refurbished gallery, officially reopening in June, will be pleased to know that the museum is working closely with BNIF to ensure it is "fully representative of the modern nuclear industry."

The Science Museum has still to announce who will be paying for clearing up the displays at the end of their lives.

Mad electricity disease



Faced with disposing of the carcasses of tens of thousands of BSE-tainted cattle, the government is looking at the possibility of burning them in coal-fired power stations. Bio-fuels experts have calculated that cows would, tonne for tonne, be a better fuel source than chicken-litter.

Fibrowatt, which operates two chicken-litter power stations in England, is keen to move into cattle-fired power, and the government has approached several large generators to see if they would like to switch from coal to cows for a while.



Atoms for peace

In his book *Inside Sellafield* (Reviews, p23), Harold Bolter, a former director of British Nuclear Fuels, reveals that the reprocessing deals struck last year with Scottish Nuclear and Nuclear Electric were not as lucrative as BNIF's chief executive Neville Chamberlain claimed.

The contracts triumphantly brandished by the chief executive are, Bolter contends, "as worthless as the scrap of paper Mr Chamberlain's namesake brought back from Munich before the Second World War."



Fells down

Electrical Review, a leading trade magazine for the electrical/electricity industry, recently described Prof. Ian Fells of Newcastle University as a "nuclear apologist" and claimed that a trip to the World Energy Council Conference in Japan had been funded by the nuclear industry. The magazine had to publish an apology, albeit in five point, putting the record straight: "Prof. Fells is an expert in energy matters and an adviser to Parliamentary Select Committees, companies and organisations with wide-ranging interests across the whole spectrum of energy sources ... his attendance at the conference was funded from a variety of organisations."

Or to put it another way, Fells is not just a nuclear apologist.



Panel beater

In June, the Intergovernmental Panel on Climate Change (IPCC) will be producing recommendations for urgent action to reduce greenhouse gas emissions. In an effort to undermine the forthcoming report, the World Energy Council (WEC) has described it as deficient and of little value to policymakers. WEC's chairman, John Baker — the chair of National Power — described the IPCC's findings as "a missed opportunity to help policymakers develop realistic strategies for the possible climate change issue."

So on the one hand we have the electricity generators and oil companies arguing that we should keep talking about the possible problem of climate change; and on the other we have 2,000 leading experts on climate issues calling for urgent action. LBR wonders whom to believe.



A Sid

Complaints to British Gas have, over recent years, risen almost as quickly as Cedric Brown's income. One of the most bizarre comes from a former York city councillor Ruth Snell Rainbow Van Gogh. She accepts that she "may not have the most average or run-of-the-mill surname," but objected to a letter from British Gas which began: "Dear Mrs Snellrainbow-hallucinogenic-experience."

The employee concerned had regarded the whole matter as a bit of a joke, his employers, however, did not and have dispensed with his services — without the £4 million leaving package given to Cedric.



That's alright then

Electricity utility Southern California Edison (SCE) recently faced court action from a former employee of its San Onofre nuclear power station. Glen James claimed that his terminal leukaemia resulted from radioactive contamination due to mismanagement by SCE.

The jury failed to find in James' favour, and the grateful utility fired out a press release singing the praises of the jury's verdict while claiming that its corporate heart went out to James' family. The press release concluded with the sensitive observation that, after all, "today, one out of three Americans will die of cancer."



Efficiency SoP

Regional electricity companies (recs) have come to accept their Standards of Performance scheme on energy efficiency introduced by the electricity regulator. This obliges the recs to spend on average £2 million per year on energy efficiency measures. This has given them plenty of opportunity for media-friendly initiatives while they get their money back through increased tariffs.

The gas regulator, Clare Spottiswoode — normally sceptical of environmental initiatives — is now considering a similar scheme for the gas industry. A consultation on the idea met with much approval, but two recs, Manweb and Seeboard, considered the scheme inappropriate — could it be that they want to keep a good thing to themselves?



Believe it or not

Little Black Rabbit was amused at the juxtapositioning of two articles in a freesheet *Nuclear worker news*, produced by the National Campaign for the Nuclear Industry Scotland.

The first article was an attack on Greenpeace and other environment groups, based largely on material from a little-known German magazine. The main, unsubstantiated, accusation being that Greenpeace manipulates the media. Adjacent to this was an item headed "Radiation link ruled out over leukaemia clusters", which ran the same misleading pro-nuclear spin that had appeared in almost all the UK newspapers on a recent government report (see p3, p6).

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