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Reprocessing: time to call a halt

PROBLEMS with British Nuclear Fuels' Thorp reprocessing plant at Sellafield mean that the company is likely to apply for higher discharge authorisations, to allow it to increase throughput of spent fuel to something approaching its planned level. Without such an increase, the already dubious economics of the venture are completely undermined.

However, as the nuclear establishment now widely accepts, there is no safe level of radiation, which means considerable economic cost from Thorp's radioactive discharges, far exceeding the forecast profit to British Nuclear Fuels. Increasing discharges to secure the expected profit doesn't make economic sense — morally it is unacceptable.

As with Thorp, reprocessing at Dounreay grows increasingly untenable, with the same arguments applying. It is time for Dounreay to concentrate on cleaning up the mess it has already created — most notably the intermediate-level shaft — not adding to it.

Reprocessing at both Dounreay and Thorp should be halted immediately. To continue with this unnecessary activity is economic folly and a moral outrage.

Thorp troubles could increase emissions p5, Dounreay under pressure p6, Collective dose p8

Labour loses the place on energy policy

AFTER some up-beat speeches earlier this year from John Battle, Labour energy spokesperson, reaffirming his party's commitment to renewable energy — 10% of UK electricity demand to be met from renewable sources by 2010 and 20% by 2025 — things have taken a turn for the worse.

First, we had shadow planning minister Keith Vaz suggesting a moratorium on wind farms in England and Wales pending a review, then the proposal from Battle that Labour would "seriously consider" including clean coal technology within the current renewable energy subsidy scheme.

The move by Vaz appears to be an ill-judged response to vocal anti-wind campaigners and their misinformed followers rather than a serious attempt to ensure the sensitive development of wind power. If enacted, it would seriously undermine the nascent UK wind industry.

With Labour's shadow Chancellor Gordon Brown forbidding any spending commitments by his colleagues, Battle has been reduced to robbing Peter to pay Paul. Clean-coal technology is certainly worthy of government support — it makes sense to use our fossil fuels in a less damaging way — but depriving renewable energy of funding to do this is absurd.

In trying to offend no-one, Labour's energy policy is in danger of becoming as farcical as that of the Conservatives.

Labour plans for coal, wind and utilities p22

Nuclear privatisation: what has it achieved?

BRITISH Energy's privatisation finally happened in July, raising a mere £2.1 billion for the government, not even as much as it cost to build Sizewell B. From the roll-call of state privatisations, this one was surely the most disastrous. As before, the usual supposed benefits of a market based approach will be heralded.

The foremost claim is always efficiency. But, efficiency drives in the nuclear industry (job losses and reduced maintenance) have meant that safety is an ever increasing worry. We now have more stakeholders, of the kind who buy shares for the guaranteed payback rather than any great wish to be part of a nuclear industry, and who will never have any significant say in the running of BE (something which British Gas shareholders learnt to their dismay on attempting to block big boardroom pay rises). Cash flow has certainly been created — dividends for the shareholders and a big pay package for the man at the top, plus plenty of cash flow from the taxpayer to the government to clean up some of the mess created by the very power stations and research facilities that the taxpayer paid to build.

Will privatisation help to secure a nuclear future, all the more secure because of the sense of responsibility that private ownership imparts? BE's first planned new station is a gas-fired one, and BE is underinsured for its nuclear stations.

Even the market competitiveness of nuclear power has only been achieved by creative accounting and over 40 years of heavy subsidisation.

The government might have been expecting a reduced workload from offloading the running of the PWR and AGRs. But it took them 17 years to juggle the parts to find a saleable combination, and now they will spend time commissioning reports on how to tweak the market.

Pre-election tax cuts then? At a push.

When will the government just admit that it isn't the invisible hand of Adam Smith at work, but the greedy, myopic eyes of the exchequer?

Nuclear privatisation: no winners p4

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Nuclear privatisation: no winners

AFTER seven years of planning, the nuclear industry has finally gone critical on the Stock Exchange. Far from being the final feather in the government's privatisation cap, bringing in substantial sums for pre-election tax cuts, the nuclear sale was a flop, despite the bargain basement price and government backed guarantees.

Current 'City' estimates are that £2.1 billion will be raised for the exchequer — £1.4 billion in shares and £700 million from debt loaded onto the newly privatised nuclear generator — about £500 million short of what the government wanted "to cover Magnox decommissioning shortfalls".

On its first day as a private company British Energy's (BE) shares crashed from a starting price of 105p to 94p at the close of trading. (At the time of writing, things have improved a little for the nuclear free marketeers with shares languishing at 101.5p)

Taxpayers have fared no better, according to a report on *Nuclear liabilities left in the state sector* by operational research consultant Mike Sadnicki.* Commissioned by Friends of the Earth and the Consortium of Opposing Local Authorities, and released in June, the report warned that the sale would leave the taxpayer some £1.2 billion short of what was expected from the sale, because of the low sale price and debt write-off.

In addition, Sadnicki says, Magnox decommissioning will cost the taxpayer £15.5 billion, which, when added to the £6.9 billion liabilities remaindered from the sell-off, brings the total public undiscounted nuclear burden to £22.4 billion. The taxpayer would have paid this regardless of the sell-off, but the cash profits from various activities would not have been siphoned off by the private sector.

Bribery

In addition to breaking its promise to parliament that liabilities would follow assets into the private sector, the government also guaranteed investors first year dividends of 13.7p, giving a total payout for all 700 million shares of around £96 million, almost double the £49 million first year profit — the first profit ever made by the stations — forecast for BE by the government advisers Barclays De Zoete Wedd. The influential Financial Times Business Information publication *Power In Europe* described the proposed dividends as not so much an inducement "as unabashed bribery".

Despite such generosity, share prices fell and the government has been left holding some 12.5% of the available shares, by far the largest amount left over in any of its privatisations.

While City analysts began a post-mortem, Energy Minister Tim Eggar said he was "delighted with the success of the sale. We have completed the first stage of the privatisation of the electricity industry and in the process raised over £2 billion for the taxpayer."

Although a mini crash on Wall Street, just before the share offer, undoubtedly had an effect on trading, most analysts point to over-optimistic assumptions about BE's future performance made in the privatisation prospectus and a stream of damaging revelations about the safety of its stations as the real causes of the poor performance.

Just hours after the bid deadline for individual shareholders, BE announced that two of its seven AGRs had to be closed because of fears about possible cracking in sensitive steam pipe welds. Hunterston B and Hinkley B were shut for two weeks to allow engineers to detail the extent of cracking in the welds and have now been reopened.

Denying Labour's accusations that investors had been deliberately misled, the government said that sufficient warning of the impending closure appeared in the prospectus which gave details of the closure of two other AGRs of a similar design — Dungeness B and Heysham — earlier this year, when cracks were found in their pipe welds.

Damaging leak

Further damaging City confidence, a letter received by *The Guardian* from anonymous scientists at BE claimed vital decisions are being delayed until after the privatisation process is complete. The scientists warn that the increasing problem of failures in AGR fuel pins would mean "the numbers of pins failing in an accident would be many times greater than the safety case allowed for."

It is thought that the damage to the pins is being caused by vibrations created as the carbon dioxide cooling gas is pumped around the system. In an emergency shutdown the damaged pins could break, releasing fission products into the cooling gas which would then be vented into the atmosphere, contaminating the area downwind of the reactor.

While the government asserts that this problem is well known, the

privatisation prospectus only refers to Hunterston B. However, according to a Nuclear Installations Inspectorate (NII) statement, issued after *The Guardian* received the letter, five further AGRs are being investigated.

In the long term the problem could lead to the NII ordering the reactors to be operated at reduced power to minimise the stresses on the fuel pins. Such a plan would drastically cut BE's income. The "privatisation means that this problem and its inevitable consequences are being covered up," the scientists told *The Guardian*.

It has also been revealed that BE has encountered problems with leaking fuel pins in its flagship Sizewell B Pressurised Water Reactor. During the plants annual shutdown for maintenance and refuelling, a surprisingly high number of pins were found to have leaked. BE says there are no safety implications but would not rule out the possibility of the reactor being closed for longer than planned.

Safety risk

Hardware problems aside, continued staff cuts within BE could increasingly compromise safety, according to a leaked briefing document by government advisers Clifford Chance, a top City law firm. The document, dated April 25, comments that nuclear inspectors "seemed increasingly to be treating manpower as a safety issue" and warned of the inherent dangers in increasing reliance on outside contractors.

The briefing also noted that "a quarter" of the 20,000 "current and ex-radiation workers" at Nuclear Electric will die of cancer, "about 200 a year by the turn of the century". This is likely, it says, to lead to an increasing number of claims for compensation.

In the end it is difficult to see who has benefited by this privatisation. The taxpayer has lost money, the investors have lost money and nuclear safety also seems to be losing out!

■ BE's first new power station looks set to be gas fired. The company has begun a feasibility study into construction of a unique gas plant adjacent to its nuclear plant at Heysham.

The idea is that considerable savings can be made by sharing Heysham's turbines. At £150 million it would be half the price of a stand-alone system. □

* "Nuclear Privatisation: Liabilities Left in the State Sector". Available from Cola, South Somerset District Council, Council Offices, Brympton Way, Yeovil, Somerset BA20 2HT.

Thorp troubles could increase emissions

RADIOACTIVE discharges from Sellafield's Thermal Oxide Reprocessing Plant (Thorp) will have to be increased if BNFL is to have any chance of meeting throughput targets set for the plant.

After two years of operation, BNFL's flagship plant appears to be sinking. It has reprocessed less than 250 tonnes of spent nuclear fuel, nowhere near the 500 tonnes BNFL told the High Court, at the end of 1993, would have been reprocessed.

If the plant is to regain lost ground then throughput will have to be significantly accelerated, this will require an increase in its radioactive discharges. The Environment Agency originally told *The Guardian* newspaper that it expected BNFL to apply to increase its discharges. Now, however, it refuses to comment until it receives an application.

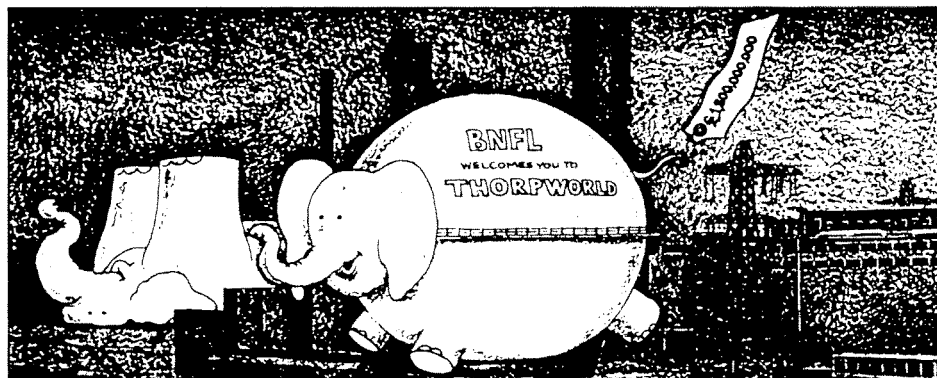
According to an analysis of Thorp's performance by Cumbrians Opposed to a Radioactive Environment (CORE):

"The knock-on effect of Thorp's poor performance levels is to place an even greater strain on the remaining baseload programme. If targets are to be met by 2003, the plant must now attain a consistent annual throughput of 900 tonnes, a rate considerably in excess of its expected operational capacity, an impossible task given the technical problems already slowing the plant's

performance."

BNFL has rejected claims about poor operation: "Thorp will be a success not only for BNFL but for Britain ... We are still on target to reprocess 7,000 tonnes of spent fuel in the first ten years."

The company has simply shifted its goal posts. It now refers to the baseload period — the first ten years — as ending in 2006. □



Japanese vote against nuclear station

A small Japanese town has voted against the construction of a nuclear power station in its area, in the country's first referendum to be held on the issue.

Two thirds of Maki's 30,000 residents objected to the plant. The referendum marks the culmination of a long battle to let the town have its say. The sitting mayor first had to be ousted as he thought a referendum was "unnecessary", he was replaced with a local businessman who ordered the vote.

Nuclear officials have reacted coolly to the no vote which they point out is not legally binding. The Japanese government and Tohoku Electric say the company already owns 96% of the required land and the project will continue. The government believes it can still change the residents' minds. "We will need to gain understanding," said Prime Minister Ryutaro Hashimoto: "Given that we have no alternative to the energy policy we must consider nuclear energy as a main power source."

Under Japan's 1994 long-term energy plan, nuclear power will account for 40.2% of its generating capacity by 2010. Six new stations will need to be added to the 49 already operating to meet the target.

Rejecting the Maki referendum, a government spokesman said: "If the people are going to say 'no' to the setting up of nuclear power plants, they must be willing to go as far as cutting down on electric power consumption." □

Plutonium flight flask standards flawed

PROPOSED new International Atomic Energy Agency (IAEA) standards for flying plutonium should be rejected as inadequate and based on unproven assumptions, according to the Nuclear Control Institute (NCI).

The Washington-based anti-proliferation lobby group is calling on the IAEA's board of Governors to reject the standards being put forward by the Agency's Advisory Committee on Safety Standards.

Ten years in the making, the Advisory Committee has put forward pitifully inadequate criteria for the proposed new Type C air transport flasks, argues the NCI. "A study carried out by the International Civil Aviation Organisation (ICAO) found the tests for new Type C air-transport packages to be much less vigorous than those for 'black box' flight

recorders. The black box test corresponds to an impact speed of 130m/s — virtually identical to the US cask standard — compared with 90m/s for the new casks. The fire test for the existing cask (800°C for 60 minutes) is also considerably less severe than the test required for flight recorders (1,100°C for 60 minutes)," comments NCI director Paul Leventhal.

The US has already given the IAEA notice that plutonium flights in the Type C flask will not be allowed to cross its air space. No plutonium flights have taken place in the US since 1975, when stringent safety criteria, reflecting realistic accident conditions, were passed. So far all attempts to design a flask to meet the standards have failed.

NCI has also called on the board to reject German-backed amendments to the safety standards which would exempt

mixed oxide (Mox) plutonium-uranium fuel from requiring Type C transports. The proposed exemption is based upon the unproven claim that Mox fuel qualifies as being a "low dispersible material" and therefore the highly toxic plutonium would not spread in a plane crash.

The UK currently flies fresh Mox fuel to Switzerland and is expected to fly such fuels to Germany if the weak IAEA standards are approved. So far, German federal attempts to fly unused Mox breeder fuel to Dounreay in Scotland have been blocked by Hessen state officials; however, if the proposed standards are passed, then federal officials are likely to try again.

The passing of soft standards would also allow Germany to fly unused Mox breeder fuel from Frankfurt to Dounreay. □

Dounreay under pressure

DOUNREAY is continuing in its desperate bid to attract research reactor reprocessing contracts despite further revelations of nuclear waste mismanagement on the site and growing fears about the long-term integrity of its controversial waste shaft.

After eight weeks at sea, on 16 June the MV Condock finally delivered its cargo of 114 spent highly enriched uranium (HEU) fuel rods from Australia for reprocessing at Dounreay. The site's management has admitted that it is the last contract and if it can't secure more then the research reactor reprocessing plant will close.

However, the management is hopeful of attracting further contracts to reprocess more of the 1,000 spent fuel elements, which were fabricated in the UK, currently stored at the Hifar research reactor near Sydney. It has also emerged that the German Research Ministry is trying to convince its research reactor operators to have up to 1,500 US-origin elements reprocessed at Dounreay. While the ministry publicly maintains that its policy is to have the spent fuel shipped back to the US for disposal, a leaked draft document questions the reliability of the newly agreed US take-back policy and promotes the "tried and tested reprocessing technology" at Dounreay.

The leaked document, passed to the German newspaper *Süddeutsche Zeitung*, reveals that the ministry is worried about HEU supplies for its planned new HEU-fuelled research reactor, the FRM-II at the Technical University of Munich. Dounreay gives the option of getting back "HEU as a reprocessing product (about 72% of U-235)."

The US is hostile to the construction of the new reactor, believing the continued trade in HEU to be a serious nuclear proliferation risk and will refuse to take back HEU from the existing Munich research reactor, the Atomic Egg, if the new one goes ahead. It has further tried to block agreements between Germany and Russia for HEU supplies.

Currently, Germany has enough HEU to fuel the new reactor for only six years of its proposed 40-year operating life. Noting that Dounreay has run out of business, the report reveals that the ministry has been holding discussions with other European operators in Belgium, France and Austria, who might also be interested in using Dounreay "in order to prevent the shutdown".

So keen is Dounreay to attract the German rods that, according to the industry journal *Nuclear Fuel* (NF) its reprocessing charges have been more than halved, from \$9,800 per kilo of HEU to \$4,800. According to NF, senior US

officials who have visited Bonn to try and prevent reprocessing at Dounreay said the British contracts contain government subsidies but are still more expensive than the \$4,500 per kilo US option.

Many German research reactor operators don't want to have their spent fuel reprocessed at Dounreay because this would mean having to take back the waste generated; the US option does not involve waste return. In the wake of recent riots in Germany over the return of nuclear waste from reprocessing in France, a senior US diplomat said "moving spent fuel to the US would help alleviate that pressure" on reactor operators who will lose their licence if they cannot store spent fuel: "At some point reprocessing waste will have to come back to Germany — whether the German public accepts it or not."

A decision on the German contracts was supposed to have been made in July, but it has, unsurprisingly, been delayed.

Contamination

Meanwhile, anxiety about the levels of contamination on and off the Dounreay site continues to grow. Fragments of fast reactor fuel contaminated with Cobalt-60 have been found along roadside verges leading from the fuel cycle area to the so-called intermediate-level waste shaft. According to the Nuclear Installation Inspectorate (NII) the UKAEA has "undertaken a comprehensive programme of studies to establish the source of the cobalt-60 finds."

"Although there are no firm conclusions on the origin of these particles, it would appear that they may originate from the transfer of fuel flasks between the fuel cycle area and the shaft." Of the 15 such particles so far uncovered, four were found outside the site's perimeter fence on the rocky coastline. The NII says it will be "impossible to locate and remove every particle currently in the environment." An urgent investigation has been ordered by the inspectorate.

While Dounreay struggles to come to terms with past mismanagement, a Dounreay employee has told the *John O'Groat Journal* that the newly privatised AEA Technology is playing fast and loose with the staffing of its health physics safety teams. Health physics monitors are the first line of defence in an emergency, but according to Dounreay employees understaffing means that monitors are "working as many hours and as many double shifts as possible in the working week as well as rest days, and going for weeks without a day off."

"How", they want to know, "can people who spend their time cat napping all over the site, supposedly be looking after the safety of others?" The high cost of training monitors is thought to be the main reason for the lack of safety staff.

Cost should not be a factor in deciding how best to deal with Dounreay's intermediate-level waste shaft, says the government's Radioactive Waste Management Advisory Committee (Rwmac). While the UKAEA has been considering what to do with the shaft since 1976, a year before it exploded, it has so far come to no firm conclusion but has two possible strategies: "waste retrieval, decommissioning of the shaft, and disposal of the intermediate-level waste in the proposed Nirex repository; or in-situ confinement and immobilisation of the waste."

The UKAEA favours in-situ confinement, which at £100 million would cost half that of the more technically challenging option of waste retrieval. Indeed, this was what it intended until Rwmac and the NII made it clear that they also wanted proposals covering the removal option. Rwmac clearly favours removal: "Rwmac is concerned that cost should not be the over-riding factor in deciding on the most appropriate strategy."

However, even if retrieval is adopted, Rwmac believes it will have to be undertaken soon, as "from 2020 coastal erosion may become an important factor affecting the ease of waste retrieval."

Action on the shaft may need to be taken by 2010, comments a recently released UKAEA document, to prevent the sea eroding the foundations necessary to build a recovery platform around the top of the shaft.

Rwmac is further concerned that UKAEA doesn't know how the waste is distributed in the shaft, and is seeking further clarification. Its fears about the configuration of the dumped waste, with its cocktail of nuclear contaminants, were further boosted when it was revealed, at the end of May, that UKAEA had dumped borated glass — a neutron absorber — into the shaft in 1968 because of fears about a critical mass being formed. However, the shaft remained in use until 1977, when there was a chemical explosion.

Calls for an inquiry into decommissioning the shaft have been rejected by the new site manager Dr Roy Nelson: "I personally do not see any need for an inquiry. Any decision, I suppose, could be challenged. But the decision will be made on a mixture of safety and economic grounds, with safety dominating. There is no doubt about that." □

Rwmac annual report

A strategic plan for the disposal of high level nuclear waste is urgently needed says the government's Radioactive Waste Management Advisory Committee (Rwmac), reminding the government of a commitment it gave in 1981 to develop the necessary research strategy.

In its annual report,* Rwmac gives its support to the current policy of allowing the waste to cool for 50 years in vitrified form. However, it laments that when "the high-level waste research drilling programme was announced ... it was ... not followed through to the extent necessary." Rwmac is worried about confusion which exists over what will happen to the high-level radioactive waste and cites the current view that 2040 would be the earliest date for commissioning a high-level waste repository against a date of 2080 given to the government's waste review by the "Nuclear Industry".

Rwmac supports the government's commitment to "producing a national statement setting out the decisions to be taken and milestones to be achieved in developing a high level waste

repository", but comments that no commitment has been given to report annually. "This commitment should", it says, "be made."

Further confusing the issue, the deputy chairman of British Nuclear Fuels, Neville Chamberlain, has said that high-level waste could be stored safely for thousands of years in an above ground "glass pyramid".

Storing the waste permanently at Sellafield is "certainly one solution", he said. "The store built at Sellafield to take waste is certainly capable of surviving, once the doors are locked, for many hundreds and thousands of years."

Greenpeace has given a cautious welcome to Chamberlain's comments, saying: "If you store the waste above ground and you can monitor it, we would have to agree with it unless some better option emerges in the future."

However, Chamberlain also suggested that the people of west Cumbria would be entitled to exact a big price for "being the solution to a problem the rest of the nation seems to have." □

* "Sixteenth annual report of the Radioactive Waste Management Advisory Committee", HMSO, July 1996.

Nuclear subs

ROSYTH and Devonport are to remain naval nuclear knackers yards until 2012 at the earliest, the defence secretary Michael Portillo has confirmed.

The dockyards currently play host to 10 rusting nuclear submarine hulks, four at Devonport and six at Rosyth, and are likely to receive another ten by 2012.

After removing the radioactive core and spent fuel, Portillo said, the submarines could be removed to the Nirex repository as soon as it became available. However, according to Nirex — which gives 2015 as the current opening target date — by 2012 the UK's backlog of radioactive waste will take twenty years to process, so the submarines could be left to rot until 2032. Storing them afloat, Portillo claimed, was the "best and safest option".

Dunfermline MP Rachel Squire reacted angrily to the disclosure: "We will tell the Secretary of State for Defence that it is not on. His government has taken work away from the site and left us with the garbage. I'm inclined to suggest to him that the best thing to do with both the submarines and waste is to park them outside the Ministry of Defence on the river Thames." □

BNFL wins US clean-up contract

BRITISH Nuclear Fuels (BNFL) has won a \$600 million contract to help clean up the US's massive military industrial complex at Savannah River in South Carolina, its largest ever overseas deal.

The company is part of a consortium which has secured a \$6 billion deal to treat, store and dispose of nuclear waste at the site. It brings the amount won by BNFL Inc, BNFL's snappily titled six-year-old US subsidiary, to \$1 billion.

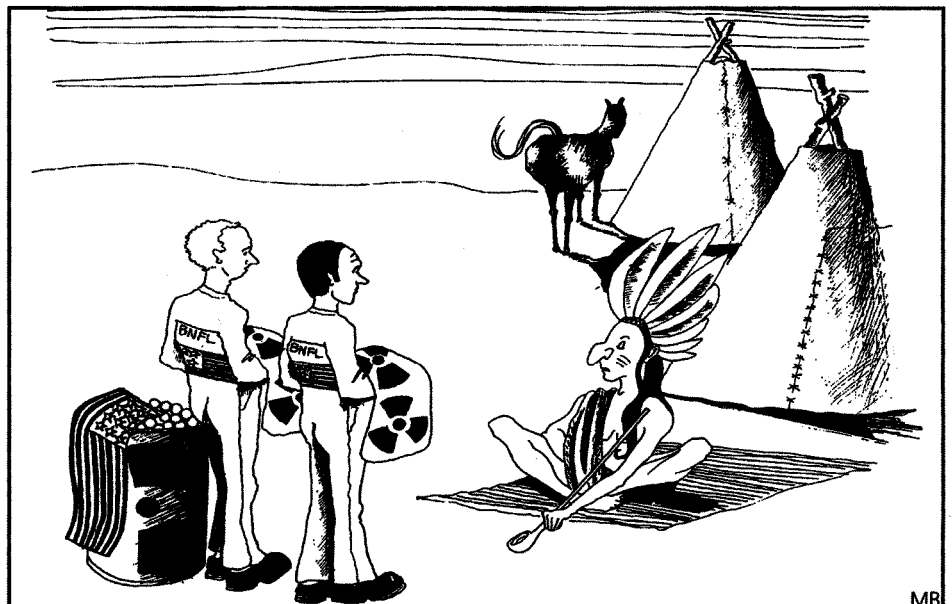
Meanwhile, BNFL Inc has galloped into the middle of a dispute between the grandsons of two legendary American Indian chiefs, Geronimo and Cochise. The two are at loggerheads over plans to store nuclear waste on the Apache reservation in New Mexico.

BNFL is holding discussions with the chief of the Mescalero Apaches, Wendell Chino, on the possibility of building a nuclear store for 40,000 tonnes of spent fuel on the reservation, which the Indians would then rent to US nuclear utilities, until a national repository becomes available. It is estimated that the Apaches could earn up to \$250 million over 40 years.

Silas Cochise welcomes the talks, saying they offered "a once in a lifetime" opportunity. "A lot of our people are unemployed and we want to create long-term employment for our people." While his boyhood friend, Joseph Geronimo, wants to know why it has to be stored

on an Indian reservation: "if the spent fuel is so safe why don't they keep it where it is? Because the white people don't want it."

"Yesterday they gave us smallpox infested blankets, and today they give us the storage site." □



Collective dose — time for a fresh look

The ICRP's 1991 rejection of a threshold for radiation's effects is still a matter of controversy, particularly in the US and France. However, one practical implication is that, the calculation of collective doses from globally distributed nuclides is valid, explains Ian Fairlie.

THERE are essentially two methods of measuring or predicting the radiological impacts of nuclide releases from the nuclear industry: first, dose to an individual member of the 'critical group'⁽¹⁾ and second, collective dose. The radiation protection community tends to use the former, rather than the latter parameter. But individuals and groups concerned about radiation's hazards may take the view that collective dose is also a realistic measuring stick for radiation's effects as it estimates the effects of nuclide releases on populations and it does so over the lengthy time frames of important nuclides.

Numerous arguments exist for the wider use of collective doses, and they are likely to be increasingly made use of in such areas as environmental impact statements and public hearings.

What is collective dose?

Collective dose is defined by the International Commission on Radiological Protection (ICRP) as the product of the number of individuals exposed and of their average radiation dose. Such average doses tend to be small, so the validity of multiplying them up falls or stands on whether a lower threshold for radiation's effects does or does not exist. With the ICRP having, in 1991, adopted a linear, no-threshold model for radiation's effects, collective dose is valid, and as a result interest in it has been stimulated, as witnessed by a number of recent articles⁽²⁾ and publications.⁽³⁾

As a measure of the total exposure of a population over time from a given release of radionuclide and an indicator of total detriment to health from the resulting radiation, collective dose is important. Its calculation is usually for all time in the future, given the long half-lives of some nuclides, although truncated time periods, eg 500 years, are also used especially where shorter-lived nuclides are involved. More detailed definitions together with their aims and methods of assessment are found elsewhere.^(4,5) The main point about collective dose is that it represents an attempt to quantify the radiological impact of radiation practices to populations larger than the critical group. Regulatory criteria for radiation practices need to be concerned with collective, as well as individual, harm.

Occupational, or local or regional populations are the usual subjects for whom collective dose is calculated. The European regional and UK local doses from annual nuclide releases from the Sellafield reprocessing site have been calculated by the National Radiological Protection Board (NRPB) to be respectively 310 and 33 person sieverts (Sv) per year.⁽⁶⁾

In addition, in the case of certain nuclides which have long half-lives and become globally

dispersed, including Tritium (Hydrogen-3), Carbon-14, Krypton-85 and Iodine-129, it is internationally-accepted practice to calculate global collective doses.^(4,7) These global doses are calculated using global dispersion models for each nuclide, usually using a world population of 10 billion, and are untruncated (for all time in the future). This is necessary because of the very long half-lives of key nuclides — I-129, 15.7 million years and C-14, 5,780 years for instance. The untruncated global collective dose from annual nuclide releases from Sellafield reprocessing is 4,100 person Sv per year,⁽⁶⁾ for example. Groups who wish to use collective doses in their submissions should take care to state to which populations and over which time frame their collective doses refer.

A brief history

Use of collective dose by national and international regulatory and advisory bodies on radiation has a long history.⁽³⁾ In 1965, Canada was the first country to introduce an annual collective dose limit of 100 person Sv per nuclear power station, with doses to the North American population calculated over 500 years. Sweden maintains an annual limit of 5 person Sv per GW_e of installed nuclear capacity,⁽⁸⁾ calculated to a European population of 300 million truncated to 10,000 years.

The ICRP has stated that, as regards the justification of radiological practices, "radiation detriment should be explicitly included in the process ..." and that "collective effective dose is an adequate representation of the collective detriment"⁽⁹⁾ (Paragraphs 115,118). The ICRP has also stated that the calculation of collective dose constitutes an integral part of the optimisation of practices which result in exposure to radiation.⁽¹⁰⁾ Two major reports in the mid-1980s gave theoretical underpinning to the concept of collective dose and remain relevant today.^(11,12) Both reports recommend calculating collective doses for justification and optimisation (ie restriction of doses) for radiation protection purposes. Both contain reservations about predictions of collective dose derived from contributions to populations so far in to the future.

Limitations

Collective dose has a number of limitations, particularly as regards the calculation of global doses over millennia.⁽¹³⁾ Inevitably, uncertainties exist with regard to assumptions about the sizes and habits of populations for long periods into the future. However, useful comparisons of collective doses may be made between two radiation practices as long as the assumptions used in such calculations are the same. It remains helpful in the design of radiation facilities to compare options for processes, procedures, engineered vaults, barriers, or containers — for

instance, a comparison of the two options for dealing with spent nuclear fuel, storage and reprocessing, would be helpful. In addition, the Lindell report (one of the mid-1980s reports referred to earlier) states that such calculations are useful, in the absolute sense, for giving some indication of the scale of the expected detriment from a practice, and for indicating the main nuclides of concern.⁽¹¹⁾

Major contributors

Carbon-14, Iodine-129, Chlorine-36, Krypton-85 are major contributors to collective dose — they have relatively long half-lives, are quickly distributed throughout the global environment⁽¹⁴⁾ and are readily taken up by plant and animal life, including humans in most cases. C-14 is the major contributor to global collective doses.^(15,16) For example, C-14 accounted for 85% of collective doses from Sellafield reprocessing releases in 1991.⁽⁶⁾ In another example, in 1995, the European Union published the results of a joint European Commission-US Department of Energy study on the external costs of the nuclear fuel cycle.⁽¹⁷⁾

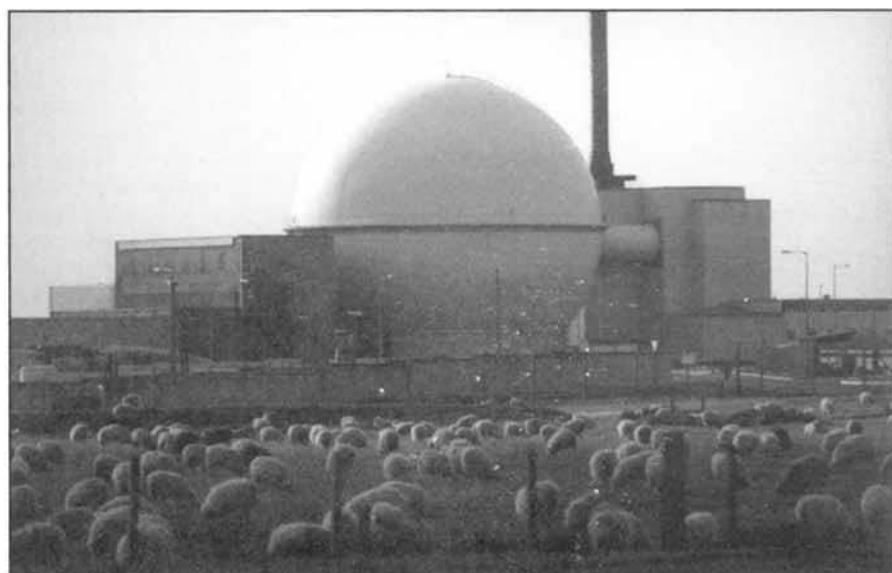
The European Commission (EC) report was produced by the Centre d'étude sur l'Évaluation de la Protection dans le domaine Nucléaire (CEPN), a research agency funded by the Institut de Protection et de Sûreté Nucléaire, Commission de l'Énergie Atomique and Cogema in France. The study focused on the French nuclear fuel programme in order to generate external costs of nuclear-generated electricity. The report stated that the collective dose from reprocessing accounted for 84% of the total collective dose from the French nuclear fuel cycle. Over 99% of this stemmed from C-14 releases.

Application

Table 1 shows first approximations of global collective doses from the main contributors, C-14, Kr-85 and I-129, from the recent UKAEA request for increased reprocessing at Dounreay.⁽¹⁸⁾ These figures are presented in line with one of the four main applications of collective dose proposed by Lindell,⁽¹¹⁾ ie, as an input to justification assessments,

TABLE 1

Dounreay collective doses (for eight years' discharges) in person Sv				
Air emissions from fuel cycle area main stack, ie, reprocessing emissions				
Nuclide	Requested limit or discharge TBq/a	Untruncated collective dose to Europe person Sv	Untruncated collective dose to world person Sv	Collective dose calculated by UKAEA person Sv
H-3	2.8	0.03	0.4	0.02
C-14	>0.025	> 1.6	>23	not reported
Kr-85	5,000	0.64	7.4	0.4
I-129	0.0017	0.19	1.6	not reported
Totals		2.36	32	



Shaun Burnie

indicating the total detriment from a proposed practice.

The Dounreay plant in the North of Scotland, set to increase radioactive discharges

These are relatively simple calculations, where projected terabecquerel (TBq = 10^{12} Bq) releases from the reprocessing are multiplied by global dose conversion factors. These express the untruncated collective effective dose in person Sv to the world population resulting from each TBq discharged to the atmosphere anywhere in the world. Global dose conversion factors have been calculated from global dispersion models for I-129 and C-14, developed by the NRPB for the European Commission,⁽¹⁴⁾ using a methodology for assessing the radiation related consequences of nuclide releases to the environment, also developed by the NRPB for the EC.⁽¹⁹⁾

Implications

Most of the above is relatively uncontroversial and accepted by large sections of the radiation protection community. The fur begins to fly when one attempts to translate collective dose into real detriment, such as deaths or money equivalents. If one were to apply the ICRP's risk factor for fatal cancers, 5% per Sv, to the global collective doses from Sellafield reprocessing mentioned earlier,

TABLE 2

Values of perons SV adopted by different agencies		
Agency	£ value of statistical life	£ value of person Sv (fatal risk = 5% /Sv)
NRPB 1993		20,000
Dept. of Transport 1992	700,000	35,000
BNFL 1991		100,000
European Union 1995	2,000,000	100,000

"The straight-forward conclusion from this particular calculation is that it is time we stopped the environmental disaster of reprocessing."

then one would obtain $4100 \text{ person Sv} \times 0.05/\text{Sv}$, about 200 fatal cancers. This means that each year of Sellafield reprocessing discharges would be expected to result eventually in an additional 200 fatal cancers throughout the world over all time in the future. This is a slightly nebulous concept, but according to present scientific concepts, this is what will occur. Whether it is meaningful to talk about deaths which may occur at some indefinite time in the future is a moot point.

Money equivalents have been calculated for a person Sv and are used for cost benefit studies in order to assess whether it is worthwhile carrying out remedial work or ending certain processes. Wide diversity exists in the value of a person Sv. Table 2 sets out the values used by various agencies using the ICRP's risk factor of 5% per Sv.

There appears to be little rationale in such wide variations. Indeed, *The Social Costs of Fuel Cycles*, a Centre for Social and Economic Research on the Global Environment report, reveals a wide range of recommended person Sv values from £3,000 (1988 prices) to £100,000 (1990 prices).⁽²⁰⁾ The latter figure is used by BNFL for example to reflect both statistical risk and corporate profile⁽²¹⁾. Environmental groups might be tempted to use the same figure. If applied to the global collective

dose from Sellafield's annual reprocessing-related discharges, it would result in the following sum: $4,100 \text{ person Sv} \times £100,000/\text{person Sv}$ which gives £410,000,000.

This is the maximum sum of money in cost-benefit analysis which could justifiably be spent to ameliorate or reduce annual Sellafield reprocessing discharges to a level at which they no longer cause this detriment. This large sum dwarfs the £50 million annual profit that BNFL expects to make over the next 10 years from its Thorp reprocessing plant, a profit made by polluting the rest of the world with radioactive carcinogens. The straightforward conclusion from this particular calculation is that it is time we stopped the environmental disaster of reprocessing.

As an aid to making decisions on the benefits or otherwise of nuclear activities, or simply as a measure of radiation related ill health, collective dose is useful. When assessing costs and benefits of the nuclear industry, the costs are inevitably hazy due to the long-lived nature of certain nuclides and the delay in the effects of radiation exposure becoming visible (and thus attributable to a specific cause). Collective dose is an important tool for those struggling with assessing the costs of radioactive contamination. □

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District heating in Lithuania — need for reform

DISTRICT heating is widespread in Lithuania, both in homes and in other buildings, with virtually all towns and villages having extensive systems. In all, 87% of buildings in Lithuanian towns obtain their heat in this way, a total of over 850,000 flats. In recent years, as the price of heat has risen and industrial production has declined, many industrial enterprises have disconnected from the district heating systems, so that residential buildings now consume approximately half the heat generated. Industry consumes 30% and the remainder is used by schools, hospitals, agriculture and other users.

At present, the majority of the fuel consumed in district heating schemes is imported, with only 15% coming from Lithuanian sources such as fuel wood and peat. Heavy fuel oil accounts for 40% of the total, gas 30%, coal 8% and light oil 6%.

One company, Lietuvos Energija, dominates the market for district heating. From its four combined heat and power (CHP) plants and 234 regional boilers, the company produces and distributes more than 90% of the heat supplied. The total capacity of its plant is over 15,000MW Thermal.

Financial crisis

In recent years, the market for heating has experienced a major financial crisis, caused by the increasing numbers of consumers failing to pay their heating bills and by rising production and distribution costs. State organisations and industrial consumers have been particularly to blame for arrears.

In the residential market consumers already pay on average about 20% of their income on heating

(with most of the remainder spent on food). Part of this problem is caused by consumers being unable to regulate their heat consumption, as the systems do not have even simple devices such as thermostatic valves on radiators. This results in the annual average heat consumption being very high at 300 kWh/m².

Declining support

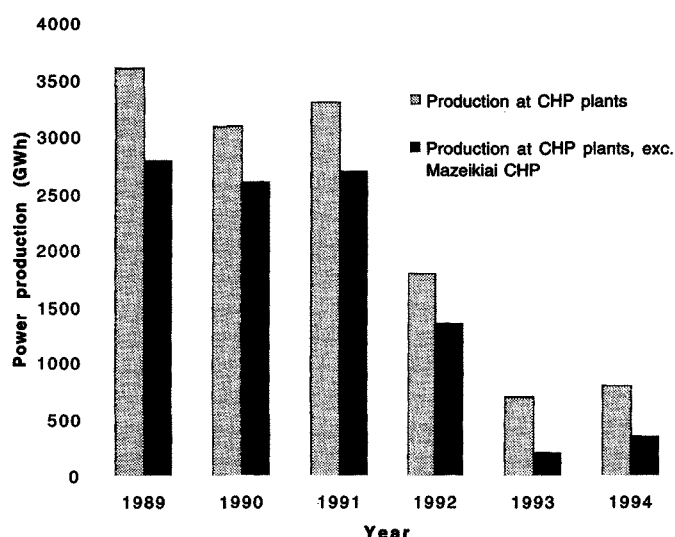
The proportion of heat supplied from CHP schemes has declined over recent years due to what has been considered comparatively cheap electricity produced by the Ignalina nuclear power plant and in part because of industrial decline. Excluding the plant at Mazeikiai which supplies heat to an oil refinery, CHP output has declined by approximately 85% across the country since 1991, as can be seen in Table 1.

One of the underlying problems facing the suppliers is that the cost of generating heat is still greater than the tariff charged. In 1993 the cost of production was 39% higher than the tariff, in 1994 it was 63% higher, and by mid-1995 it rose to double the tariff. This resulted in losses of £50 million in 1995, despite prices to the consumer rising by 200 per cent in July 1995. The tariffs are now close to real cost levels, and with no method of support for low-income households, and indeed no surveys having been undertaken to determine residents' ability to pay for energy, the social consequences of the drastic price increases are as yet unknown, but feared to be devastating to many households.

Consumer debt at the end of 1995 exceeded £33 million. At the same time, Lietuvos Energija had debts totalling £186 million, leaving the organisation on the verge of collapse.

The extensive, centralised district heating systems used in Lithuania have been hit drastically since independence; V Klevas, V Kveselis and M Tamonis investigate.

Table 1: Power production at Lithuanian CHP plant



The solution of the country's heating and energy crisis must lie in reform of the industry. The present tariff structure with each home receiving a set bill, and the centralised nature of the industry, effectively block incentives for reform.

Construction of small CHP plant, especially using domestic fuel resources, could help to solve the problems. However, with an increasing lack of working capital, due primarily to problems of consumer debt and depreciation of main assets, it will be difficult for reform of the sector to be undertaken. □

V Klevas, V Kveselis and M Tamonis are researchers at the Energy and Air Pollution Information Centre, Lithuania.

Energy from waste, or a waste of energy?

With energy from waste taking the lion's share of the UK's non-fossil fuel obligations, Alison Doig and Roland Clift look at how to assess the environmental merits of these projects.

UNDER the Non-Fossil Fuel Obligation (Nffo) England and Wales and, more recently, the Scottish Renewables Obligation (SRO) and the Northern Ireland-Nffo, production of electricity from waste is classified as a renewable energy. The heading of 'energy from waste' includes the mass burning of municipal and industrial waste, power plants burning refuse derived fuels and the combustion of landfill gas. The ultimate stretching of the Nffo and SRO terms 'renewable' and 'non-fossil fuel' is the inclusion in the programme of waste tyre incinerators — about half the materials in vehicle tyres are made from fossil fuels.⁽¹⁾

The Nffo and SRO programmes give priority and premium rates to power supplied from selected renewable energy projects. The programmes are subsidised by a levy on fossil fuels. Between 1990 and 1994, of the 329MW of plant commissioned through Nffo, 210MW were from energy from waste schemes.⁽²⁾

Aside from questioning the renewable nature of waste as a fuel, two key questions must be asked about the environmental advantages/disadvantages of using waste or waste derived fuel:

In comparison with other energy sources (in particular the fossil fuels which it is aimed to replace) is waste an environmentally preferable option?

Is combustion the most environmentally sound option for waste material?

Minimisation of waste has to be the preferred environmental option, but no matter how far the current consumerist, throw-away trend is reversed there are always going to be residues produced from an industrialised society. So is energy from waste the best way to deal with it?

The European Commission has produced a hierarchy of preferred options for waste management:

Reduction
Re-use
Materials recovery (recycling)
Incineration with energy recovery
Incineration without energy recovery
Landfill

This hierarchy was produced on a somewhat arbitrary basis, without full consideration of the real environmental impacts associated with each

of the options and with no consideration of site specific constraints. For example, the recycling of paper in the UK requires considerable amounts of fossil fuel, whereas in Scandinavia paper production is fuelled primarily by hydro power. Therefore, in the UK it may be more sensible to use waste paper as a bio-fuel to save fossil fuels than to consume fossil fuels to save renewable paper. In a similar arbitrary way, the Nffo/SRO programmes have given a clear preference to energy from waste without considering the full environmental implications.

There is a need for an environmental policy guidance tool to make more informed choices both for waste management and energy policy. One approach which is gaining increasing favour is the life cycle approach, or specifically for energy systems, the full fuel cycle approach. Life cycle assessment (LCA) studies of waste management systems⁽³⁾ and full fuel cycle⁽⁴⁾ studies are being seriously undertaken by the UK government and the European Commission, with parallel studies in the USA.

Life cycle approach

Methods currently used for providing environmental data on power generation or for regulating the impact of a power generating system on the environment focus mostly on the combustion process itself, ignoring the wider environmental impacts relating to the fuel cycle. Also, the greatest emphasis is placed on gaseous and water emissions from the plant, excluding other important environmental factors. Life cycle assessment widens the scope for assessment of environmental impacts, therefore encompassing a more holistic approach.

Environmental impact categories in LCA

Depletion of natural resources with distinction between renewable flow and non-renewable resources, eg fossil fuels and minerals

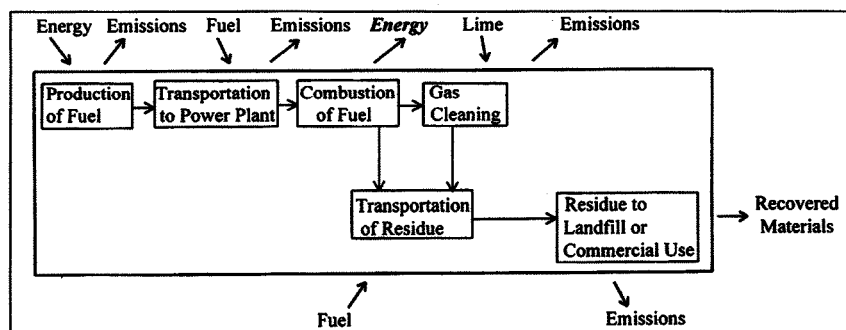
Pollution. Emissions of substances with a potential to contribute to:

- global warming
- depletion of the ozone layer
- acidification
- eutrophication
- impairment of human health and/or ecosystems (human toxicity and/or ecotoxicity)

Impairment and/or disturbance of the environment through:

- space requirements, for instance for landfill, transport systems and installations
- noise
- smell
- radiation

Figure 1: Cradle to Grave power production from fuel combustion



The term 'cradle to grave' analysis has been given to LCA as it assesses the life cycle of a system for providing a product or service, from extraction of primary materials to the disposal of residues from the system, including all the transportation and process stages involved in providing the product or service. Figure 1 shows a simplified fuel cycle for energy production from fuel combustion.

Where waste is the fuel, the power plant has two functions, that of a power plant and that of a waste management facility. The plant may also have a third function as a material recovery facility, with metals and gypsum recovered from the residues. The full fuel cycle impact assessment must make credits for the waste management functions. This is done by assessing what environmental impacts are avoided by replacing virgin materials with recycled and what impacts are avoided by not mass landfilling the waste. The avoided impacts are subtracted from the impacts of the fuel cycles.

Energy from waste tyres

Waste tyres are an interesting example of the energy from waste dilemma. Most waste tyres are currently landfilled, with potentially valuable resources lost to holes in the ground. However, in the UK there is currently one operating waste tyre incinerator under the Nffo agreement, at Wolverhampton, with others planned for central Scotland and the South of England. Meanwhile, there are alternative materials recovery technologies becoming available, which either re-use crumbed tyre material or thermally decompose (pyrolyse) waste tyres to produce oil, gas and carbon black. Taking such a life cycle approach for the example of waste tyre disposal in the UK, we ask our key environmental questions:

How do waste tyres compare to other fuels?

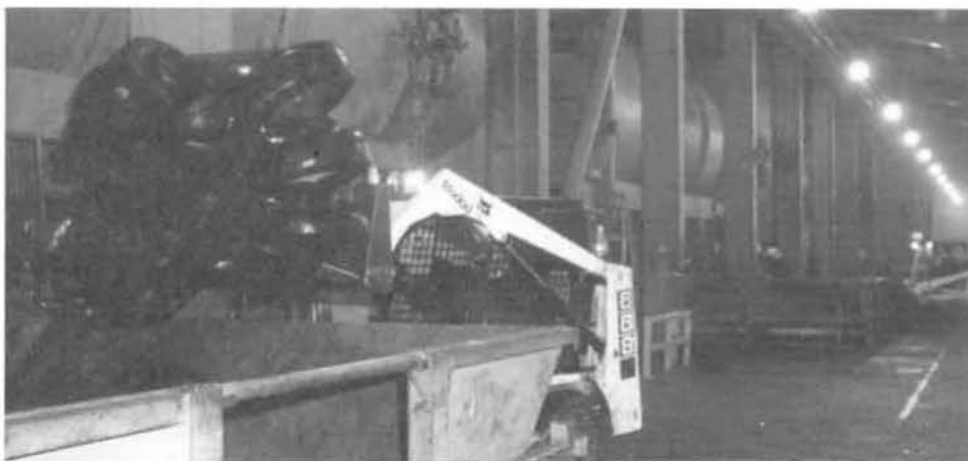
Fuel Production: Waste tyres are a by-product of the car industry, and not extracted specially as a fuel, as is the case with coal or natural gas. Waste tyres have a higher calorific value than coal and have relatively low chlorine and sulphur content.

Transportation: The waste tyre fuel is available locally in the UK, though it has to be transported from dispersed sources by road. Coal and gas are currently bulk transported by rail or pipeline from UK sources (though as British gas runs out and coal mines are shut, imports will become the major fuel source).

Combustion of waste tyres: Waste tyre combustion is controlled under the waste incinerator regulations, which are stricter than for fossil fuel combustion.

Residues: The residues from the waste tyre incinerator are mostly recycled: steel is sold as scrap, ash is re-processed for zinc oxide and gypsum is used as a soil improver for agriculture.

It would appear that, as a fuel, waste tyres compare favourably with fossil fuels. Is incineration for energy recovery the best option for waste tyres rather than alternative waste management options?



Elm Energy's tyre-fuelled power station, Wolverhampton.

Retread: Retreading of tyres from heavy goods vehicles is very common, and reduces the quantity of tyres going directly to waste by at least 40%. Car tyres are not designed for repeated retread and the market is very small. Encouraging a more positive attitude to car tyre retread would significantly reduce the overall quantity of tyres going to landfill each year, but not remove the need for tyre disposal at the end of their useful life.

Pyrolysis: decomposing of waste tyres into oil, gas and carbon black, currently being done in the UK on a small scale, opening the opportunity for localised disposal. A full life cycle assessment of an operating waste tyre pyrolysis process was carried out to compare an operating pyrolysis plant with the Wolverhampton waste tyre to energy plant.⁽⁵⁾ The result showed that the pyrolysis was preferable in most of the environmental categories assessed, though slightly worse in the very important category of human toxicity. The main constraint to commercial success of the pyrolysis process is that markets for its products are not yet established.

Mechanical Recycling: waste tyres are crumbed, either by mechanical shredders or by cryogenic shattering. The crumbed tyres cannot be made into new tyres due to structural changes in the rubber, but the number of uses for waste tyre crumbs is increasing, from shoe soles to sports field surfaces. No formal LCA of mechanical recycling of waste tyres has been done. However, the option of localised disposal with materials recovery is becoming increasingly viable.

Conclusions

Energy from waste introduces many complex issues, in both the power sector and the waste management industry. Currently there are arbitrary, blanket policies which favour energy from waste in the power sector, but favour materials recovery from waste in the waste management sector. By taking a full fuel cycle approach, individual components of the waste stream can be assessed for their environmentally preferred disposal option and for their suitability as fuels for power generation.

The example of waste tyre in the UK shows that materials recovery may be the preferable option for this component of the waste stream, as long as there is a market for the recycled product. However, until such markets expand, waste tyres can be viewed as a useful fuel for power generation. □

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Sweden's nuclear phase-out — to be or not to be?

Starting the phase-out of nuclear power in Sweden, decided in a referendum in 1980, is proving to be politically controversial. Björn Eriksson describes the current debate.

AFTER a referendum in 1980, the Swedish parliament set a deadline of 2010 for a phase-out of the country's nuclear power stations as they came to the end of their economic life.

At the time of the referendum there were six operational power stations and six under construction. Halfway to 2010, not one reactor has been shut down and no decision has been made concerning how and when the shutdown will take place. Last year a government commission looked into these questions, but only ended up muddying the waters. Now party leaders are meeting to try to negotiate some elements of a phase-out plan before the next general election, in 1998.

The outcome of the 1980 referendum is not treated lightly in Swedish politics. The issue of nuclear power led to a period of overt conflict in Swedish society; the Social Democratic government lost power in 1976 after it underestimated the strength of anti-nuclear feeling amongst its supporters. Two years later a three-party coalition government, led by the anti-nuclear Centre Party, collapsed under pressure from the anti-nuclear movement demanding that the government match its words with deeds. After the failure of two consecutive governments to deliver, the anti-nuclear movement launched a campaign to "let the people decide" and demanded a referendum. Rather than let another election be dominated by the nuclear issue, the political parties acquiesced.

Government avoidance

The decision against nuclear power in Sweden, a home-grown industry, was a profound step, more so than the halting of the nuclear programmes in countries such as Austria, Denmark or Italy which were very much dependent upon foreign technology. However, the practicalities of a nuclear phase-out in Sweden have been avoided by the government, with the Social Democrats, though prepared to support other technologies, fearing that starting the phase-out could prove politically controversial.

While the construction of new reactors in Sweden is not a subject that is much discussed today, even by the nuclear industry, the industry is campaigning against "premature" shut-downs, arguing that the assumptions made in 1980 regarding the technical and economic lifetime of the reactors were wrong: the reactors will work perfectly well for more than 40 years, so let them, it argues.

The Swedish nuclear industry was started with

government encouragement after World War II, in order to produce atomic weaponry and electricity from domestic uranium resources, and in the process to create an industry for exporting nuclear technology that was independent from the other nuclear powers. This is a good example of the industrial politics practised by the Social Democrats at the time, the primary goal of which was to help develop modern competitive industries with the potential for securing export contracts and creating jobs in Sweden.

The military part of the project was weakened by the success of the peace movement in the fifties and early sixties, and plans for reprocessing and developing combined military-civil reactors were dropped. However, despite these setbacks, the nuclear industry before 1970 still received considerable government support. Swedish engineering company Asea and the state formed a joint venture called Asea-Atom, which developed a model light-water boiling reactor, and the fuel elements for it, based on licences from General Electric. Other companies produced turbines for the reactors, reactor vessels and zirconium cladding, although the reactor programme now relied on enriched uranium from the nuclear powers.

During the 1970s, five reactors were built in Sweden, a number of others were started and many more were envisaged, some of them close to cities, to be used for electricity and district heating. This is the programme that was challenged during the seventies and the referendum result dealt a severe blow to the future of the Swedish nuclear industry.

Some of the companies gave up their nuclear programmes, Asea-Atom merged with Brown-Boveri to become the atomic division of the multi-national company ABB, and survived by carrying out repairs and improvements on its own nine reactors and, through European Union-funded programmes, safety improvements few others in Eastern Europe. But it still faces lean times without more active domestic support.

Call to begin process

While the leaders of the nuclear industry want greater support for nuclear power and a postponement of the start of the phase-out programme, the environmental movement has been trying to forge alliances to help encourage the Social Democrats to at least start the closure programme. Evidently, the nuclear debate has not died down since the referendum and the time for practical measures to be implemented is fast approaching. A definite plan for phase-out is still to be determined and it looks like it will require a strong government to start the process. □

Björn Eriksson is an environmental expert working with SIS in Gothenburg, Sweden.

Hopes pinned on Save-2

If an initiative does not provide added value, it should not be undertaken. In these days of profound Euro-scepticism bordering on xenophobia, any new proposal from the European Commission (EC) needs to be examined with considerable rigour, to ensure it does meet this key criterion. On this basis, the commission's new five year Save-2 programme comes through with flying colours.

What does this acronym mean? What will the programme do?

The acronym itself stands for "Specific Actions for Vigorous Energy Efficiency". Save is intended to strengthen the various energy saving initiatives currently being undertaken in each of the 15 Member States of the European Union (EU).

Save-2 does have the considerable virtue of swallowing up two other, albeit minor, energy saving programmes (PACE and PERU). It comes in the wake of the initial Save programme, which has run since 1990, and was originally designed as predominantly a legislative programme — the mirror opposite of its successor. When first approved by the European Parliament, it contained a list of no less than 13 separate proposed new laws. These ranged from requiring energy surveys on all buildings changing hands, to minimum insulation standards for all new buildings, to requirements for biennial surveys of all heating equipment to check efficiency levels.

None of these proposed new laws have made their way onto the statute books. Just as the programme was getting going, a wave of scepticism about the appropriateness of Brussels becoming involved in issues surrounding non-traded goods swept around Europe.

The argument went that while it was reasonable for the EC to be involved in setting efficiency standards for goods traded across frontiers, it was quite wrong for it to have anything to do with energy used in buildings. Buildings, after all, do not up sticks and cross borders.

So this time round the EC is taking a very different approach: Gone is the long list of proposed laws; gone too is the low budget with which a legislative programme can make do. In its place comes a much wider ranging approach — and a budget increased fourfold to help fund it. These increases have however fallen foul of national governments.

At this spring's Energy Council meeting the Council of Ministers cut the 'official' budget from 30 million Ecu per annum to just 9 million. Yet, given the enthusiasm for the programme from both the Commission and, importantly, the Parliament, it is likely that the eventual out-turn figure will still end up closer

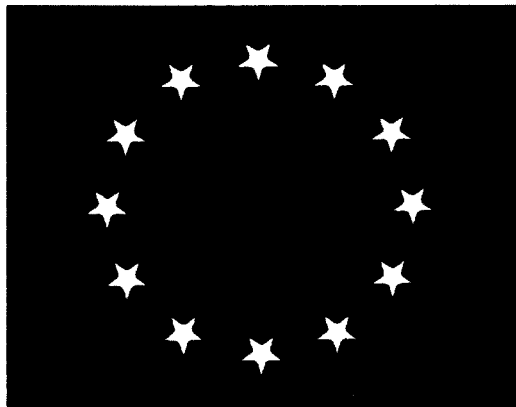
to the original figure — such is the Byzantine nature of EU expenditure!

Essentially, what the new Save offers is pump-priming funds. Certainly, attempts to obtain agreements leading to legislation on traded goods like office equipment will continue as before. The long-promised Draft Directive requiring distribution energy utilities to undertake 'integrated resource planning' has been issued. But the real nub of this programme will be devoted to providing financial resources which can help to circumvent many of the barriers which exist in every country, and which hinder rational investments in end-use energy saving.

Particular emphasis is being placed upon the need to nurture pan-Community networks running co-operative projects. This could include international architectural associations, networks of energy educators, trade associations, energy efficiency industry link-ups and consumer groups. Much attention will be devoted to working on the ground at a local level, involving county, district, even town councils. The unspoken subtext seems to be that much more progress is likely at this level than via the leviathans of central government.

Back in 1985, the then 12 Member States set a joint target of improving energy efficiency by 20% over the ensuing decade — as had been achieved in the previous ten. They failed. It now looks as though they shall have managed just 8% across 10 years. No such overall target is being set for the next decade. But Save-2 has its target. Over the next five years Save-2 is promised to improve Europe's energy efficiency by 1% a year. This is in addition to any improvements national programmes may bring. Up to 70 Mtoe (million tonnes of oil equivalent) will be cut.

As the financial statement attached to the new Save perceptively points out, having failed to get agreement on its energy/carbon tax, this programme "remains one of the only Community instruments still likely to make a significant contribution to the reduction of carbon emissions by 2000". There is much riding on Save-2. It must not disappoint. □



Is a new European Commission energy efficiency programme the answer to diminishing European energy savings?
Andrew Warren discusses Save-2.

Andrew Warren is the director of the Association for the Conservation of Energy.

Selling green electricity

With recent advances made in renewable energy, and plans to further open up the UK electricity market in 1998, the economic prospects for 'green' electricity are beginning to be seriously considered, reports Graham Stein.

OFTEN portrayed as subsidy junkies, renewable energy developers may soon be competing in the market place with conventional generators. A recently completed, European Commission-funded study has been looking at the prospects for developing a UK-wide market for 'green' electricity.

For simplicity this market is called the Green Pool, but should not be confused with the Electricity Pool of England and Wales. The basic idea of the Green Pool is to give consumers the option to purchase electricity which has been generated from renewable energy sources.

The study was designed in line with a number of European Commission (EC) objectives, principally a doubling in the use of renewable energy sources from 4% of energy consumption in 1991 to 8% in 2005.

There are a number of countries within the European Union which have national programmes aimed at stimulating the development of renewable energy markets within their own national boundaries, for example the Non-Fossil Fuel Obligation (Nffo) in England and Wales. The major difficulties with all of these programmes are the time and expense required to comply with the procedures and their intermittent nature, which combine to discourage the development of a substantial renewable energy industry.

To overcome these difficulties and to increase responsiveness to public support for renewables and the desire to purchase green electricity, it is proposed that a renewable energy trading pool, the Green Pool, be established, to provide a market for the electricity produced by such power plant. A framework for the Green Pool has been developed to suit the UK electricity market, and it is possible that this UK model could be used to develop a Green Pool in other European countries. The UK was selected for developing this concept because it is more

open to competition than any other electricity market in Europe.

In the UK, from 1 April 1998, all consumers will have the option to purchase electricity from any licensed supplier. These suppliers are normally known as Second Tier Suppliers. There are already over 30 of these suppliers, including the regional electricity companies in England and Wales, Scottish Power, Scottish Hydro-Electric and several generators licensed as Second Tier Suppliers for customers in the over 100kW market.

In addition, 1998 is the final year of subsidised contracts under the first two orders of the Nffo, so these renewable energy projects will be looking for new markets.

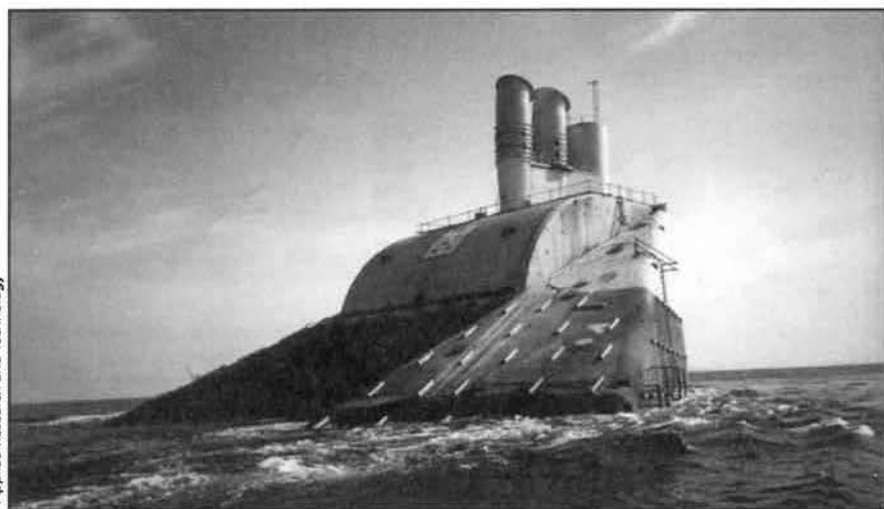
The opening of the gas market in the south-west of England to full competition in April of this year illustrates the type of problems that are likely to be encountered in the electricity market in April 1998. The scramble for customers by the gas companies caused a lot of confusion. Despite companies offering up to 25% discounts on the standard British Gas tariff, consumers showed a resistance to change, with only some 7% switching to new suppliers.

For companies considering developing the Green Pool, one of the key factors is the level of interest from potential customers. The first phase of the EC-funded study involved a survey of the industrial and commercial markets. This revealed some interesting results, which at first sight were not particularly encouraging. Although the majority of the respondents expressed an interest in using green electricity, very few of them were willing to pay a higher price for such electricity. However, if some companies were seen to be gaining a competitive advantage through their use of environmentally less damaging electricity supply, other companies in the same sector would join the Green Pool, even if it meant paying a higher price.

Initial targets

Currently, the economics of producing green electricity mean prices higher than those paid by medium and large business consumers to traditional suppliers. In view of this, it is likely that the Green Pool will initially be targeted at domestic and small business consumers. The average price paid to UK generators for their electricity is around 3.4p/kWh, which compares with contract prices under the Scottish Renewables Obligation averaging 4p/kWh for wind farms and 3.8p/kWh for small-scale hydro. When you also take into account transmission costs of about 0.5p/kWh, then local generation by renewables, avoiding transmission costs, becomes an economic proposition.

The physical arrangement of the UK electricity



grid makes it impossible to trace the flow of electricity from a power station to a consumer. All that can be said is that a power station is providing sufficient electricity to meet the demand of a group of consumers, regardless of their locality. The relatively limited quantity of generating capacity which would be within a Green Pool means that it would not be able to follow exactly the changes in demand from its consumers.

But, the Green Pool will be able to provide consumers with a guarantee that sufficient green electricity will be produced over a period of time to meet the total demand in this period. In other words, the Green pool could not match the exact power demand (kW) of consumers with green power at every instant, but could provide the number of units (kWh) of electricity required by consumers over a year. To be able to match the exact power demand, the Green Pool would have to be of a similar size to the existing electricity companies.

The aim of setting up a Green Pool is to encourage the development of renewable energy. Each unit of electricity produced through the Green pool will replace one that would have been generated using fossil fuels or nuclear energy. The benefit to consumers is that they will be playing a significant part in encouraging the development of renewable energy within the UK.

Community projects

Most renewable energy power stations are on a scale which fits well with the electricity demand of the local community. However, it is difficult for a local community to successfully develop a renewable energy project in isolation because of the complexities of the UK electricity market. For example, no power station is able to generate electricity all the time; typically, even small-scale power stations are closed down for a period of a few weeks to allow annual maintenance to be undertaken.

If a local community was relying on its own power station for electricity, it would either have to have a standby generator or buy electricity from another source. In addition, there is the continuous problem of matching generating output and demand. The Green Pool could offer a solution to this by providing a market for excess electricity generated and a source of electricity to meet higher demand as required.

It is estimated that in the UK, under current market conditions, the renewable energy resource that could be developed through the Green Pool is in the range of 11,800 to 19,800 GWh per year. This would represent between 4% and 7% of total electricity supplied. The quantity of resource that is actually exploited will be determined by the willingness of consumers to purchase green electricity, and the ability of the Green Pool to



National Wind Power

Wind farms like Kirkby Moor, Cumbria, (above) are turning a green dream into a commercial reality. Will wave power survive the set-back of ART's Osprey I (opposite) and make it to the market place too?

provide such electricity at a price that is acceptable to consumers.

It is intended that the Green Pool will accept electricity from any generator able to be described as using a renewable energy technology and capable of producing electricity at a price that is acceptable to consumers. The list of technologies which are usually accepted under government renewable energy schemes are wind, hydro, tidal, wave, biomass, landfill gas and waste to energy. The last two of this list, however, fall into a grey area and not everyone considers them to be sustainable sources of energy.

The view of those promoting the Green Pool is that all of these technologies should be accepted, but if consumers wish to exclude certain technologies then the price of electricity to these consumers should reflect this preference. The cost of electricity produced by landfill gas and waste to energy is often lower than from the other technologies listed; some consumers may be willing to pay an additional cost for their exclusion, others may not.

While the precise structure of any Green Pool is still to be decided, its success in encouraging renewable energy development will be dependent on sufficient consumer support and the ability of generators to supply increasing quantities of green electricity which is economically and environmentally acceptable. □

"Each unit of electricity produced through the Green pool will replace one that would have been generated using fossil fuels or nuclear energy."

Plutonium Mox: fuelling the problem

With a growing world stockpile of plutonium from civil and military sources, Shaun Burnie looks at the problems of its use in the commercial nuclear sector, including the so-called Mox solution.

IN the international attempt to find a solution to the problems posed by large stocks of plutonium, the nuclear industry should be the last place to look. It created the problem in the first place with its fantasy of unlimited electricity from plutonium recycling. And yet the nuclear fuel services industry — led by BNFL in the UK, Cogema in France, Siemens in Germany and Belgonucleaire in Belgium — is promoting the use of plutonium fuel as Mox (mixed oxide plutonium/uranium) fuel as the best means to use commercial plutonium stocks and burn plutonium released from nuclear weapons disarmament. In both cases the use of Mox presents serious environment, health and security dangers.

The short-term prospects of the fuel industry are financially good, though from early next century their profit margins are less assured. Reprocessing and plutonium fuel use look less attractive for the customers, the nuclear power utilities. In Germany, Belgium, Switzerland, and even France there is concern about the price of Mox compared to conventional uranium fuel. With the serious delays in Japan's nuclear programme, the industry is privately worried.

The nuclear industry has identified the disarmament process as an opportunity to expand its profits and extend its lifetime. Perhaps most importantly of all, it sees a decision to use plutonium fuel for "getting rid" of weapons material as buying governmental support well into next century. Playing a central role in plutonium disposition, it believes, will guarantee its future to a time when commercial breeder reactors will be coming on line. Consequently, decisions on plutonium disposition which may be made over the next 12 months are strategically very important in determining whether the anti-nuclear movement will still be campaigning to stop reprocessing and breeder reactors in the third and fourth decade of the next millennium.

If the United States and the Russian Federation fully implement their disarmament commitments over the next few years, approximately 100 tonnes of plutonium will be released from dismantled warheads, and both Washington and Moscow are looking at how to manage this material ("Plutonium: piling up problems", SEJ109). Though little is known publicly about the decision-making process in Russia, the Ministry of Atomic Energy (Minatom), accountable to almost no-one, continues to promote the concept of burning plutonium in the next generation of breeder reactors — the BN-800 series. In the United States, in a process led by the Department of Energy (DOE), the issue remains in the balance between plutonium burning in conventional reactors or vitrification as radioactive waste. A major consideration for both countries is the economics and to what extent central government is prepared to pay for any option that will cost tens of billions of dollars.

When the US DOE launched its public consultation process on plutonium disposition earlier this year, 15 electricity utilities from across the US had already informed the DOE of their interest in offering their reactors for warhead plutonium Mox burning. In addition, in 1995 Atomic Energy of Canada Limited (AECL) submitted a proposal to burn US plutonium Mox in its Bruce A reactors.

The US nuclear utilities, under political and public pressure since Three Mile Island, have accepted that they should be involved in the process of plutonium disposition even if they do not in the end burn plutonium in their reactors, but their prime motive is still commercial. Despite statements pledging support for US government decisions that are in the national security interest, their main concern is the hard economic realities, especially given their relative decline in competitiveness with other electricity suppliers.

Peco Energy, for example, which is offering four reactors (Limerick 1 and 2, and Peach Bottom 2 and 3), has already received direct government subsidy of US\$50 million for taking fuel from the defunct Shoreham reactor, as well as free fuel valued at US\$70m.

For AECL in Canada, the rationale is even clearer. The proposal worked out between AECL and the DOE is for approximately 50 tonnes to be burned in two Bruce A Candu reactors located on Lake Huron, Ontario. It would take 25 years to burn all of this material. The background to this proposal is that the Bruce A reactors all require retubing (the rebuilding of the core, where all fuel channels are replaced) early next century at a cost estimated by AECL at Cnd\$300 million for each reactor. AECL hopes that by becoming a key player in weapons dismantlement it will receive financial support from Washington in the form of fuel subsidy, and financial and political support from the Canadian government for retubing. The benefit of using Candu reactors rather than US pressurised water reactors is that the former can be loaded with a full core of plutonium Mox fuel, rather than one-third cores as is the case with most PWRs (full cores are reported to be possible with the Palo Verde reactors in the US).

Fuel fabrication for either a US PWR or Candu option will require the construction of a new Mox facility in the US. Thus, Mox fuel fabricators Belgonucleaire and BNFL have been promoting their services in Washington in recent months. Suggestions that Mox from US plutonium may be fabricated in Europe and then reshipped across the Atlantic, even in the bizarre world of the nuclear industry, seem unlikely to be realised.

Despite the large number of utilities expressing interest in the Mox option, most if not all would drop out if they believed that central government would not provide substantial subsidies.

Of course concentrating on the economics is to forget the very real health, environmental and non-proliferation implications of the US opting for 30 years or more of Mox burning. Issues that utilities and even the DOE are tending to forget rather too easily. But Mox is a direct weapons material, and a US decision to opt for Mox would send a signal to the international community that plutonium fuel was acceptable. The US DOE has not included non-proliferation consequences in its Environmental Impact Statement on plutonium disposition. This despite the DOE stating earlier this year that: "We are certainly sensitive to the proliferation concerns that are raised by setting up a Mox fuel system in the United States, and if we decided to pursue that option we would want to be sure we addressed those concerns."⁽¹⁾

However, the DOE has so far failed to give serious consideration to the non-proliferation aspects of Mox fuel, and time is running out. For nearly all methods of Mox fuel burning, more plutonium is created in the reactor spent fuel than is burned. Only beyond 40% Mox core fuel or so does the total amount of plutonium decline. Reactors operating with such cores are rare and experimental, and none are operated commercially in such a way.

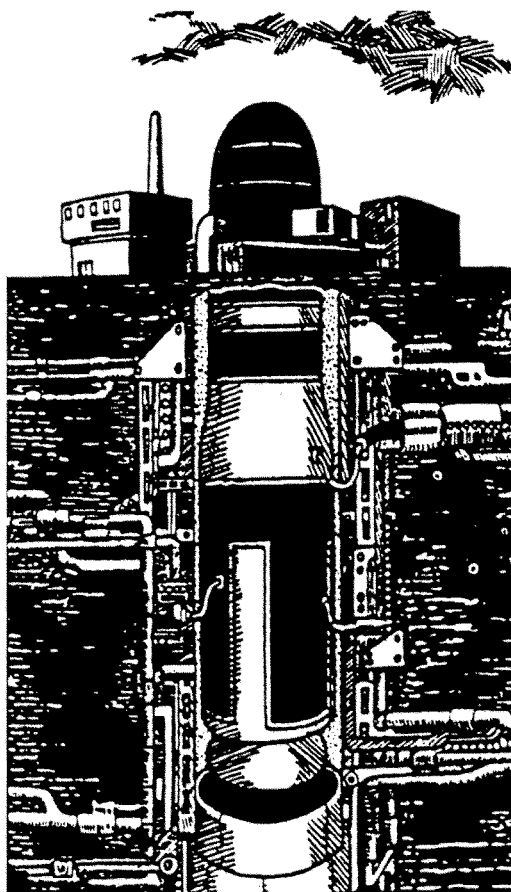
As for the health and safety aspects of Mox use in reactors, most independent analysis demonstrates that there are serious effects on the reactor physics and thus the operating safety margins, as well as higher dose levels for workers coming into contact with fresh plutonium/uranium oxide and spent Mox fuel. Other issues such as additional heat generation from the reactor spent fuel waste, as usual, are overlooked.

One important factor, previously thought critical to a US decision, is the likely impact it would have on Moscow's decision. Support for Mox would signal to Russia that they too should opt for Mox. The view prevailing in Washington today is that whatever they decide, Minatom will never opt for treating plutonium as waste. As with the US decision, the resources available to subsidise the use of plutonium fuel will likely determine the final decision made in Russia.

For reasons of nuclear engineering, and aside from unbuilt BN-800 fast reactors, the preferred reactors in Russia for weapons plutonium Mox are the existing VVER-440s. Of the six currently operating, four are of the 230 series, classified by the International Atomic Energy Agency as extremely unsafe. Even Minatom would be unlikely to place plutonium fuel in these reactors. For existing VVER-1000s, safety concerns about reduced pressure vessel size was countered in recent years by moving to a three-year fuel cycle (as opposed to four). Introducing Mox into these reactors would negate any safety benefits accruing from the fuelling decision. An increased risk of a positive temperature coefficient, power excursion and severe accident would result. Whilst funds remain unavailable, Minatom's preferred option of constructing three BN-800s will not be realised.

A sinister development occurred at the Moscow Nuclear Safety Summit in April this year when a fuel cycle memorandum was signed between Presidents Chirac and Yeltsin. Though there are almost no details publicly available, the memorandum calls for close collaboration between the two countries in maintaining efforts to close the nuclear fuel cycle, including the development of fast breeders. With the French plutonium industry increasingly concerned about international isolation leading to increasing doubts domestically as to the benefits of plutonium reprocessing, Russia presents one of the few prospects for technical and political collaboration. Whether this understanding will lead to actual financial support for Russia's plutonium programme remains unclear.

A G7-sponsored fuel cycle summit is due to take place in Paris in October/November this year. For all the promotion of Mox as the solution to the plutonium problem, the eventual decisions will be made on the basis of the available resources. A compromise solution in the US looks very likely, where both Mox and vitrification are endorsed, but only for a limited amount of so-called surplus plutonium. For the utilities it may be the future viability of their reactors that is at stake. For companies in the international plutonium industry, like BNFL and Cogema, the hope is that their futures will be guaranteed well into the next century, overlapping the time when, they hope, commercial breeders will be introduced. The stakes are high, the dangers of the nuclear arms race may be about to take a new and dangerous course. □



"As for the health and safety aspects of Mox use in reactors, most independent analysis demonstrates that there are serious effects on the reactor physics and thus the operating safety margins, as well as higher dose levels for workers."

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Further information on the issues raised in this article are available from:

Shaun Burnie, Greenpeace International, Keizergracht 176, 1016 DW Amsterdam, The Netherlands.

Implementing eco-taxes on fuel in Italy

Pierluigi Lombard outlines a study into the feasibility of taxing fuels in accordance with the thermodynamic efficiency of the process for which they are used.

THE present structure of fuel taxation in Italy is the accumulation of irrational, demagogic measures, compromises, and the victories and defeats of industrial lobbies. As is the case in much of the rest of Europe, there is no discernible link between taxation and the externalities of fuel use. If, however, fuels were taxed with respect to the thermodynamic efficiency of the processes which employ these fuels, this would encourage fuel resources to be used more efficiently.

A study conducted by Amici della Terra, on behalf of the Italian Energy Managers Association, has looked into the feasibility of establishing a thermodynamically coherent tax system, with the aim of discouraging inefficient use of fuel.

The study considered five different types of plant, calculating for each the related fiscal burden per unit energy used by the plant under the present taxation regime. The following five plant types were considered:

- gas turbines used for electricity generation only (3MW Electrical);
- gas turbine used for cogeneration (3MW Electrical and 4MW Thermal);
- electrically driven heat pumps powered from the public electricity supply (100kW, coefficient of performance 3.5);
- electrically driven heat pumps driven by a cogeneration plant having a reciprocating engine (100kW, coefficient of performance 3.5);
- heat pumps driven directly by a reciprocating engine (100kW, coefficient of performance 3.5).

For each type of plant, two different indicators were used to evaluate the schemes' thermodynamic merit: the 'Ien' index, an energy index produced by the Italian Ministry of Industry; and the 'Ir' saving index, defined as the ratio of the energy consumption of the plant to the consumption of a conventional reference plant. The higher the 'Ien' and the lower the 'Ir', the more positively a plant is considered.

The results of the study are shown in Table 1, where the plants are arranged in order of increasing energy efficiency.

It is clear that there is no consistency between efficiency and tax level. Moreover, in general, rather than the tax burden being reduced with increased energy efficiency, it actually rises. Presently taxation is not levied at a flat rate, but varies according to monthly consumption. Furthermore, the taxation differs for industrial and non-industrial users, and is dependant upon whether the energy is own-generation or taken from the public grid. The most striking impact of this is seen in the case of Plant E, the most efficient, where in the cases where the plant is intended for non-industrial users, taxes on the gas feeding the plant are increased enormously.

One rather unconvincing attempt at thermodynamic coherence is in place, with natural gas being taxed in accordance with whether it is destined for industrial, or non-industrial uses: non-industrial users, who typically use gas less efficiently, are taxed at a higher level than industry. In contrast, however, fuels destined for electricity generation (a very inefficient process) are either tax-exempt, or are very lightly taxed. Also, it should be noted that the tax levied on other fossil fuels is constant regardless of their destination.

There are also inconsistencies for natural gas. For example, a hotel is taxed at the same level as industry, whereas hospitals are considered to be non-industrial users, and are taxed accordingly.

It is evident that the link between fiscal pressure and thermodynamic uses in Italy is weak or non-existent, and the message being given to energy managers by the present tax regime leads to inefficient use of energy resources. Unless this system is radically reformed, the addition of new energy or carbon taxes would only confuse an already complex and unfair fiscal structure. Eco-taxes can still be used to encourage environmentally-friendly practices, but in the present situation it is feared that their imposition would simply result in yet another means of revenue collection. □

	Ien	Ir	Excise (Lira/MJ)	
			Industrial	Non-Industrial
Plant type A	0.10	1.25	0.39-0.59	
Plant type B	0.54	0.75	0.57-0.78	2.05-2.26
Plant type C	0.71	0.69	0.59-2.99	
Plant type D	1.23	0.48	0.55-2.19	1.67-3.31
Plant type E	1.34	0.45	0.87	7.77

Pierluigi Lombard works for the environmental organisation Amici della Terra, based in Rome, Italy.

French accounting for nuclear power

FRANCE has a very special way of accounting for energy, different to that used by any other country. By defining the electricity consumed as equivalent to the energy required to produce the electricity, the apparent importance of electricity is made to look stronger. Thus, if you are consuming one unit of energy in France, it will indeed be accounted for as one unit, unless it is in the form of electricity — in which case it will be accounted for as 2.57 units.

In France, 4,500kWh of electricity produced is accounted for on the basis of the primary energy input, which, with an average efficiency of 38.8%, is 1 tonne of oil equivalent (toe). Elsewhere this amount of electricity is measured in terms of the electricity output, 0.388toe.

As can be seen from Table 1 this can have a very beneficial influence on the way in which electricity is seen in the country's energy balance — particularly if you are an electricity producer. Rather than accounting for just 18.5% of the final energy demand, electricity is shown to contribute 36.9%. With the likelihood that the more a fuel is contributing to the country's energy balance, the more support it will receive from the government, the French electricity industry benefits.

This method has several other strange characteristics. It exaggerates the country's level of self-sufficiency in energy. With uranium being considered to be a national resource, electricity from nuclear power is considered to be indigenous, even though the vast majority of the uranium used comes from African countries such as Gabon and the Congo. Also, the energy consumed from electricity produced by hydropower schemes is represented as twice that of the energy content of the water used to generate the electricity. Who needs perpetual motion?

The importance of the nuclear industry to the national economy is also falsified in other ways. Electricité de France (EdF) states in its 1993 annual reports that tariffs in France would be

3.5% higher without exports. However, a report published earlier this year by INESTENE,⁽¹⁾ a French energy and environment consultancy, states that France would actually benefit financially by stopping the export of electricity and abandoning the construction of new nuclear power plant. It shows that the revenue received from exports is below the cost of production, when maintenance, investment, transmission and fuel costs are taken into account. EdF is estimated to be losing over £600 million/year on exports. This not taking into account decommissioning and environmental costs, which are likely to be several times larger than the losses already being incurred.

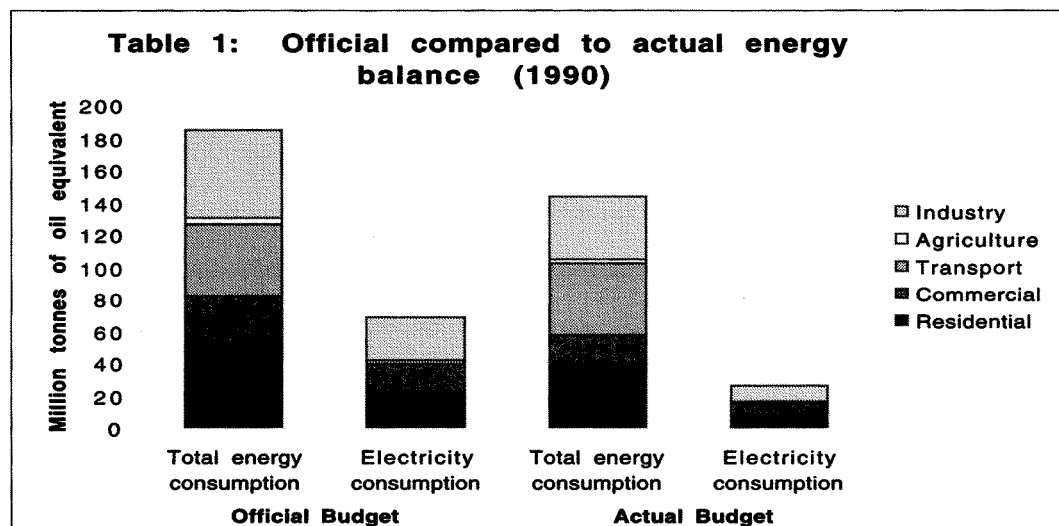
One other benefit which the French electricity industry is receiving is courtesy of the English and Welsh electricity pool. The INESTENE report calculates that rather than just supplying nuclear electricity, between 35% and 57% of electricity sold to England and Wales is effectively supplied by keeping fossil-fuel power stations operating. This means that EdF has benefited by between £30 million and £60 million a year from 'green ticket' payments which are meant to be paid for non-fossil supply.

France is in the process of building four new reactors, requiring an investment of £5 billion. Freezing construction of plant even 80% completed would match any gains to be achieved from exports, even at a favourable 8% discount rate; continuing development would be a drain upon the French economy.

The overcapacity of the electricity sector in France lessens the apparent importance of energy conservation, discouraging investment in the energy saving technologies which would benefit the country in the medium term. Support for new nuclear capacity, using dubious economic and strategic arguments, is likely to mean that calls for increased investment in energy saving measures will continue to be ignored. This would not be good news for the French economy. □

The French nuclear power industry benefits from a method of accounting which exaggerates the importance of electricity in the country's energy balance, report Jean Claude Ray and Dr John Green.

Table 1: Official compared to actual energy balance (1990)



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- 1 "France's Electricity Exports", INESTENE, 5, rue Buot, 75013 Paris. Tel: 0033145650808 Fax: 0033145897357

Jean Claude Ray is a consultant to Amis de la Terre, France. Dr John Green is European Energy Project Manager at Friends of the Earth Scotland.

1998 looms large for electricity industry

FURTHER details on the opening up of the electricity market were published by Offer, the electricity regulator, in August. Revised draft licences will change the electricity companies' supply licences to give all Britain's 21 million customers using less than 100kW the right to be supplied by the company of their choice from April 1998.

The move by Prof. Stephen Littlechild, the head of Offer, which gives him sweeping new powers, is seen as a response to accusations that he was failing to give leadership over the 1998 changes and concern that some electricity companies were trying to delay the liberalisation.

A study led by Eastern Group and concluded in August argues that the changes will need to be phased in over 18 months. The report was commissioned by the programme advisory council, comprising Offer, the Electricity Pool, 14 electricity companies and PA Consulting, which is overseeing the 1998 changes.

Eastern's findings follow a report in July by auditors Coopers & Lybrand for the Electricity Pool which cast doubt on the ability of the electricity industry to meet the April 1998 date. It concluded that the main obstacle was the lack of effective management, and was particularly critical of Offer. The report also found that many in the industry had a lack of trust in PA Consulting believing

that it was being gagged by Offer.

Littlechild has also proposed tough price controls for the National Grid in a consultation paper published in August. The controls, which would cut £1.2bn from the National Grid's revenues over four years from April 1997 have been sharply criticised by the electricity transmission company and the GMB trade union.

Meanwhile, the Northern Ireland electricity regulator, Douglas McIllood, is seeking a 10% reduction in Northern Ireland's tariffs — which are now 23% higher than in Britain — and has also proposed strict price controls on Northern Ireland Electricity (NIE).

The three generators in the province have long-term index-linked contracts with distributor NIE, and with 75% of capacity contracted to 2010 or beyond the regulator is growing increasingly concerned at the lack of competition.

If progress is not made, NIE could face an examination by the Monopolies and Mergers Commission (MMC).

■ PowerGen (PG) has finally sold 2,000MW of its generating capacity, as requested by the electricity regulator. The sale, to Hanson-owned Eastern Group, had been delayed by PG in the wake of Board of Trade President Ian Lang's blocking of its attempted take-over of Midland Electricity.

Eastern Group had already acquired

4,000MW of plant from National Power and the company will be a key part of the new energy business to be formed by the demerger of Hanson.

■ North Lanarkshire Council has rejected PowerGen's application to build a combined cycle gas turbine station at Gartcosh, which will now almost certainly go to public inquiry. Scotland already has about 100% overcapacity of generation, so PowerGen's move is being regarded by many as an attempt to muscle in on the Scottish market in response to the expansion southwards of Scottish Power (SP). A recent Offer ruling which guarantees the uni-directional north-south flow of electricity along the interconnector, thus preventing PowerGen using the interconnector for exports north, will only add salt to the wound.

The ruling follows an announcement by Littlechild in June that SP and Scottish Hydro-Electric faced an MMC investigation if they did not lower their prices to other UK power companies who supply commercial and industrial customers in Scotland.

Meanwhile, SP is celebrating that its successful bid of £1.68bn topped an offer made by Southern Electric, and the take-over was cleared by Ian Lang, President of the Board of Trade, in July. Though some analysts doubt the wisdom of the price paid by SP, the move makes SP a £4.5bn multi-utility covering electricity, water, gas and telecoms. □

Labour plans for coal, wind and utilities

IN the absence of any rescue deals, three more UK coal mines are expected to close. Previously owned by the company Coal Investments which crashed in February, the mines are now the subject of last-ditch salvage attempts. The Labour Party has asked the government-owned Coal Authority to keep the mines at least on care and maintenance, as part of a larger strategy to secure indigenous coal production for the future.

With emission restrictions on the increase, the only long-term option for the UK coal industry is seen as the use of low sulphur coal; end-of-pipe technologies which strip combustion gases of SO₂, NO_x and particulates; and cleaner, more-efficient combustion technology, reducing NO_x, SO₂ and CO₂ emissions. Shadow energy minister John Battle has said Labour would "seriously consider" including clean coal in the qualifying list for the current renewables levy, but has not specified whether this would be at the expense of renewables.

UK coal, with a few exceptions, is used for electricity generation. Contracts with the major generators are mostly due to run out towards the end of the century, when cheap North Sea gas will make further inroads into coal's market share if the present situation remains unchanged. Coal company lobbyists are warning politicians on all sides about the consequences of an over-reliance on gas — more job losses in coal mining, mining equipment manufacturers moving overseas, and the UK leaving itself vulnerable when North Sea gas runs out in less than 50 years.

Wind power: Concerns expressed over wind farm developments have prompted Labour to announce their own review of the environmental impact of wind farms. The past five years have seen a rapid increase in the number of turbines in the UK, bringing at the same time opposition from groups like Country Guardian citing visual and noise pollution. Keith Vaz, shadow

planning minister, has said that sustainable technologies should not be at "any environmental cost" and is even considering a moratorium on wind turbines.

Windfall tax: By depicting Labour's proposed tax on utilities' post-privatisation profits — the windfall tax — as hitting individual shareholders as well as the so-called fat cats, privatised utilities hope to win popular support against the tax in the run up to the next general election. National Power and the airports operator BAA are even seeking advice on the legality of the tax.

Scottish utilities Scottish Power and Scottish Hydro are arguing for exemption from any windfall tax. The two companies are of the belief that as their selling price was higher than their southern counterparts and share prices have remained relatively stable, the taxpayer got value for money in the sales and subsequent profits have not been excessive — thus there is no reason to be taxed. □

Climate change — concern grows

AN acceptance by some powerful groups that climate change is a reality which must be tackled might now lead to more, better and even legally binding commitments to reducing greenhouse gas emissions. This is the message that has come out of a series of high profile events on climate change.

The Intergovernmental Panel on Climate Change has published a huge three-volume report detailing the work and conclusions of 1,000 scientists, whose chairman described the work as "the best science on climate change the world has to offer." Although it might seem a less than earth-shattering conclusion from so much work, the most significant outcome is that the authors are agreed that there is a "discernible" human influence on climate.

Bitter attacks on the report from the Global Climate Coalition, comprising some of the giants of heavy industry, were voiced at a climate change convention in Geneva in the middle of July. Members of the coalition are opposed to reductions in greenhouse

gases — they believe that even if climate change is a reality, it would be better to cope with it rather than curb fossil fuel use to slow it down. Delegates at the UN Framework Convention on Climate Change in Geneva, the second in a series of follow-up meetings to Rio, were handed newspaper articles casting doubt on the science of the climate change advocates.

The convention ended with no defined targets and little agreement between developed countries and small developing countries which see restrictions on emissions as hindering their economic growth. But there were a few surprise developments. America replaced its preference for a voluntary approach to curbing greenhouse gases with support for the mandatory approach. And John Gummer, UK environment secretary, gave a rallying speech urging other countries to follow the UK's lead in emission reduction. The UK is one of a small number of developed countries which are so far on target for commitments agreed at Rio, but some have noted that the UK's success is more by accident than by design.

Specific targets for CO₂ and other greenhouse gas reductions are due to be discussed at the next scheduled climate change meeting in Japan, in 1997.

In the UK, John Gummer's Department of the Environment published a report forecasting Bordeaux production for the south of England and champagne in Yorkshire by 2050, due to the effects of climate change. *Review of the potential effects of climate change* is the first government report to evaluate adaptive responses for the UK. The main prediction of the south and east of Britain becoming warmer and drier, the north west wetter, holds consequences for almost every aspect of life from food supply and health to finance and tourism. For instance, predictions are for tree loss in the south but faster tree growth in the north; there will be an increased risk of malaria returning to the south after a total absence of half a century; lowlands around the Wash, parts of the Norfolk and Suffolk coastline, Teeside and south west Lancashire are all particularly at risk from rises in sea level. □

Acid rain

CONCERN over meeting European Union (EU) acid rain emission targets has been expressed by the European Environment Agency (EEA) in a study of emissions by Member States from 1990 to 1994.

The 1994 target for NO_x — stabilisation at 1985 levels — appears to have been met, but the EEA has expressed concern over the prospects of meeting the much tougher target for the year 2000 — a 30% reduction from 1985 levels.

The EEA doubts that present EU policies will be sufficient, in particular it expects a much lower drop in vehicle emissions than might be expected. Amongst the reasons for this are: slow

rate of turnover in vehicle fleets; inadequate effectiveness of catalytic converters; lack of new technologies; lack of policies for freight transport; inadequate progress in mode switching from road/private transport to rail/public transport; and the cost of biofuels.

Emissions of sulphur dioxide are more promising, with a 27% reduction between 1990 and 1994. The main reasons for this are the increased use of flue gas desulphurisation and a switch from coal to gas, and the EEA believes that the EU is on course to meet its year 2000 target.

The EEA points out, however, that even if the NO_x and SO₂ targets are achieved, there would still be areas where the 'critical loads' for acidification would be exceeded. □

EU policy

LIBERALISATION of European Union (EU) electricity markets was finally agreed by Europe's energy ministers at an Energy Council meeting on 20 June. The agreement, reached after eight years of sometimes acrimonious discussions, means a partial opening up of Member States' electricity markets to external competition. The proposal has still to be approved by the European Parliament, but is intended to be phased in from 1997 with around one third of

each Member State's market open to outside suppliers by 2003.

The agreement is far short of what some governments, including the UK's, had hoped for.

The president of the European Parliament's energy committee, Claude Desama, has welcomed the agreement but wants to see additional measures to harmonise environmental tax regimes affecting the electricity sector. If his amendments are not accepted by national governments, then adoption of the draft directive could be delayed. □

Orimulsion

JUST as Pembrokeshire County Council was about to consider an application for a purpose-built jetty for the handling of orimulsion, the Welsh Secretary William Hague intervened to prevent the council from making a decision. It is likely that the application will now go to public inquiry.

National Power (NP) wants the jetty because of its plans to burn orimulsion at Pembroke power station, and even if the jetty is given the go-ahead, authorisation for the plant to be converted to burn orimulsion is still to be given by the Environment Agency and the Department of Trade and Industry. NP has agreed to fit flue gas desulphurisation and NO_x and dust reducing measures, but has refused installation of gasification technology — which turns the fuel into a much cleaner burning gas — on the grounds of cost.

Friends of the Earth (England, Wales and Northern Ireland) has questioned the legality of the Pembrokeshire plans given that the Milford Haven Estuary is proposed for a European designation to protect birds. Environmentalists are concerned about a possible Sea Empress-style disaster involving orimulsion. □

Energy efficiency moves

FOLLOWING Parliament's decision last year not to increase VAT on domestic fuel bills from 8% to 17.5%, several efforts have been made to reduce VAT on energy saving materials from the 17.5% level.

The government has admitted that the different tax rates is iniquitous, but in March this year blocked by one vote an attempt to amend the finance bill and lower VAT on energy saving material.

At that time the Government pledged to look at other ways of achieving the VAT reduction, and a campaign is now under way to make the government live up to that promise.

Around 200 MPs are planning to raise the issue during the Budget debate in November, and the Association for the Conservation of Energy is asking people to write to their MP and to Phillip Oppenheim MP the minister responsible for VAT.

Conservation act: The Energy Conservation Act 1996, passed in July, extends last year's act to include houses in multiple occupation and houseboats.

Under the legislation, local authorities have to draw up strategic energy conservation plans for residential property in their area. Financial assistance from the Energy Saving Trust is now available for local authorities in drawing up their reports and plans. The scheme, administered by the Association for the Conservation of Energy, has a budget of £4.7 million for 1996/7, with individual awards of up to £500,000.

Lighting legislation: Lighting in all new, non-domestic buildings in England and Wales with a floor area over 100 square metres must be energy-efficient, under legislation which came into effect in July.

The requirement is contained in new Building Regulations, and the measure will also apply to certain buildings

undergoing change of use. Similar regulations are likely to be introduced in Scotland, but not until 1997 at the earliest.

EST expands LEACs: An expansion in the number of Local Energy Advice Centres (LEACs) is planned by the Energy Saving Trust. There are currently 32 centres around the country offering free advice to the public on energy efficiency. The trust hopes to expand the network to between 40 and 50. So far, the LEACs have helped around 200,000 people, saving them an average of £34 and cutting CO₂ emissions by over 70,000 tonnes.

Fridges: Proposals for improving the energy efficiency of domestic fridges were approved by the European Parliament in June. Though some MEPs argued for tougher controls, the measures accepted will cut energy consumption of new fridges and freezers by 15% over the next three years. □

Solar plans

PHOTOVOLTAICS (PV) panels will be generating electricity at 100 schools and colleges in the UK under the Solar programme. The scheme, a third of the size originally planned, is part of the government's Foresight Initiative, and will receive £1 million of government funding.

Participating schools and colleges will have to contribute £3,500, for which they will receive a 1kW PV array, and a computer linked to the Internet to monitor the system.

■ The Dutch government has established a programme to install 250MW of PV capacity by 2010 as part of a target of 10% of the nation's energy coming from sustainable sources by that date.

As a step towards this, PV panels

with a total capacity of 1MW are to be installed in more than 460 homes, a sports centre, school buildings and a community centre in the town of Amersfoort.

■ A 10MW demonstration solar power plant in California was inaugurated by US energy secretary Hazel O'Leary in June. The \$40 million plant uses computer-controlled mirrors to focus the sun's rays. Sodium and potassium nitrates flowing through metal tubes are raised to 565°C, and the molten salt mixture is then pumped to storage tanks from where it is passed through a heat exchanger to raise steam for electricity generation.

Because of the heat storage system, the plant can generate electricity for several hours after sunset, and is expected to have an availability approaching 60%. □

CHP target

THE UK government has claimed that it is "on target" to reach 5,000MW of combined heat and power (CHP) plant by the year 2000.

A strategy document to encourage wider use of CHP was unveiled by junior environment minister Robert Jones at the annual meeting of the CHP Association (CHPA). The CHP target is part of the government's programme for reducing CO₂ emissions.

The director of the CHPA, David Green, while welcoming the document, criticised the lack of detail. He does, however, believe that the target can be met, stating that: "On current trends we are well within striking distance."

The government's strategy includes supporting the electricity and gas regulators in working towards liberalised electricity markets which do not hinder the development of local CHP projects; and, through the energy efficiency best practice programme, support for R&D and raising the profile of CHP and community heating amongst non-technical strategic decision-makers.

Waste-to-energy CHP schemes are also being supported through the Non-Fossil Fuel Obligation.

■ Thirty months later than originally planned, the Citigen CHP plant in the City of London has finally come on stream. Design output from the plant is 32MW each of electricity and heat. □

Fuel cells

FUEL cell technology has progressed faster than scientists initially thought possible, cutting at least ten years off the date when a commercially produced car powered by a fuel cell will be available.

Daimler-Benz, the German car manufacturer, has launched Necar II, with a fuel cell 80% smaller than that of its predecessor, built just two years earlier. It is capable of travelling 250 km without

refuelling and has a top speed of 100km per hour. The company has now revised its estimate for the mass production of fuel cell cars down from 2020 to 2010.

■ The world's largest gas-fuelled molten carbonate fuel cell plant is now operating in Santa Clara, California. An initial hiccup involving the discovery of construction material which became electrically conductive at the plant's operating temperature of 650°C, is now largely overcome. □

Wind farm developments

FOUR more proposed wind farms in Scotland, all with Scottish Renewables Obligation (SRO) contracts, are to go to public inquiry.

Two developments for Helmsdale, Sutherland, passed by Highland Regional Council at its final planning committee meeting, were subsequently 'called in' by the Scottish Secretary, who announced in August that they were to be subject to a public inquiry. Meanwhile, the new Highland Council's planning committee has rejected a third proposal on a nearby site. The developer, Border Wind, may appeal against the decision.

The two other projects going to public inquiry are at Laggan, Islay and Largie, Argyll.

Of the remaining five SRO-1 wind farm proposals: Hagshaw Hill, Lanarkshire, is operating; Windy Standard, Kirkcudbrightshire, nearing completion; Novar, Ross-shire, now has full planning permission; and the

remaining two, Beinn Ghlas, Argyll, and Craigenlee, Wigtownshire, are undergoing environmental assessment.

An inquiry in August into a wind farm near Newcastleton, in the Borders, has been hearing opposition evidence from the RAF. Objections centre on the development requiring its own 'avoidance space' and the millions of pounds worth of radar equipment potentially being unable to distinguish between a wind turbine and a mock enemy airborne target.

Offshore

A possible bypassing of some of the 'nimby' objections associated with windfarms on land is to take a development offshore, where, in addition, winds are stronger.

Powergen is hoping to build the country's largest offshore wind farm off the coast of Great Yarmouth, although the decision to move offshore was more

one of economic viability than conflict avoidance. An idea for an offshore wind farm was put forward by CEEB scientists 15 years ago. It surfaced again at the Sizewell B nuclear power station inquiry in 1984 when one of the objectors presented it as an alternative. The idea was rejected by the Inspector and the CEEB which said that Sizewell B was a cheaper buy — it ended up costing £2.9 billion, more than twice the original estimate.

■ One-time world leader in wind power Californian company Kenetech Windpower Inc filed for bankruptcy in May.

The best Kenetech can hope for is emergence from bankruptcy as purely a maintenance company. Turbine troubles are said to have beset the company, with former employees talking of their warnings over turbine design being ignored in favour of cost cutting. □

Austrian and Swiss hydro

AUSTRIA, which gets over two-thirds of its electricity from hydro power, is seeing growing environmental opposition to further development.

Regional utility Oberösterreich Kraftwerke AG has filed a \$580,000 civil suit against Global 2000 and five individuals for damages resulting from illegal occupation of the Lambach hydro site.

Environmentalists previously in favour of hydro schemes argue that such development is now reaching its limit and that alternatives, particularly solar,

wind and biomass, should be utilised.

The Worldwide Fund for Nature (WWF) is planning to take community utility Elektrizitätswerke Reutte to the European Union court over two dams proposed for the Streimbach river, which flows into the river Lech. WWF is seeking a ruling on whether the Lech river valley is a protected area in which power dams may not be built.

Under an environmental programme, upgrading of existing hydro schemes has seen their output increase by 250GWh a year, around 0.5% of Austrian electricity demand.

■ Swiss hydro has been given a boost by the Swiss parliament's decision to increase royalty payments made by electricity companies to mountain cantons, which had claimed that hydro was being used to subsidise nuclear power.

The 47% increase to Sfr80/kW takes the royalty to the maximum allowed by law, and follows strong pressure from the mountain cantons, which had even threatened to block Switzerland's signing of the International Convention of the Alps if payments were not increased. □

Islay energy study

RENEWABLE energy potential on the Scottish island of Islay has been assessed as part of a study by the government's Energy Technology Support Unit (ETSU).

Technical support for the project was given by Scottish Hydro-Electric (SHE) which is keen to avoid having to upgrade the power network.

Wind power was considered the most promising renewable, though the need for careful site selection was noted.

Another promising renewable is anaerobic digestion of distillery waste — whisky production being the major industry on the island. Surprisingly, the eight-page summary of the study

makes no mention of the Islay wave power device which has flourished on the island for eight years.

The report also recommends energy saving by the distillers and in the domestic sector.

Ways of reducing peak demand were considered, including alterations in energy use by the distillers; and the introduction of energy storage was assessed, with pumped storage and flywheels considered the only viable options. However, an application by SHE and IES (a subsidiary of British Nuclear Fuels) for European Union funding to install a 75kWh flywheel, under the Thermie programme, was rejected earlier this year. □

EU target

RENEWABLE energy use in the EU should be tripled by 2010 according to proposals adopted by the European Parliament on 4 July.

The report, by German MEP Peter Mombaur, urges the EU to create a comprehensive action plan to increase renewable energy's contribution to primary energy from its current 5.2% to 15% by 2010. Mombaur wants to see fiscal incentives, increased funding for new technologies, and guaranteed access to electricity networks at prices that encourage renewables.

The proposals are aimed at putting pressure on the European Commission, which is due to produce a strategy document on renewables next year. □

Marketing the planet

Global warming: a guide to market-based controls on the energy sector
by Ian Fells and Lisa Woolhouse

Financial Times Energy Publishing,*
1996, 135pp, £195

PROFESSOR Ian Fells enjoys a mixed reputation among environmentalists because of his advocacy of nuclear power for combatting climate change, so it was a pleasure to find that this very detailed assessment arrives at a number of conclusions with which many 'greens' would feel extremely comfortable.

The effectiveness of various market-based tools and policies for limiting CO₂ emissions are assessed using experiences in other countries, lessons from applying economic tools in controlling other emissions, and results from two computer models. Analysis of privatisation of the UK energy industry and how this relates to environmental considerations is also included.

The study first examines the effectiveness of broad-based approaches to limiting emissions, starting with a comparison of an energy tax, a carbon tax, and an energy/carbon tax, all levied at an equivalent of \$10 per barrel of oil (the rate proposed by the European Union). The pure carbon tax proves to be the best option — not only does it achieve the greatest reductions in emissions by encouraging switching to less polluting fuels, it is also the cheapest for consumers. Under a pure energy tax, emissions actually rise above 1990 levels because, as with VAT on energy, no incentive is provided to switch between fuels. While the issue of job creation through a reduction in conventional taxes on employment is touched upon, it is disappointing that no attempt was made to estimate numbers.

Also, for a report that continually refers to the international aspects of the privatisation experiment in the UK energy industry, it is curious that there is no analysis of why the EU proposed a combined carbon/energy tax over a pure carbon tax — namely that a country like France, with its large nuclear industry would have a very small carbon tax compared to the UK or Germany, which it was felt would give an unfair competitive advantage.



This is a very important consideration as one of the stumbling blocks to the implementation of a carbon/energy tax within the EU is the issue of international competitiveness.

Next up is the proposal for tradeable permits, currently being tried in the United States to reduce sulphur dioxide (SO₂) emissions. The experience so far is mixed, with poor implementation allowing some emitters to collect permits for significant quantities of SO₂ release over some time to come. The authors consider that translating the same sort of system to CO₂ emissions would create further problems, because of the multiplicity of sources.

For energy efficiency, the problem has always been to overcome the barriers: lack of knowledge; inertia; extremely short pay-back periods applied by consumers, that have bedevilled energy efficiency programmes in the past. The authors state that market-based measures alone cannot overcome these problems and that some form of regulation is necessary. They conclude that the optimum combination would be a carbon tax combined with a range of instruments to promote efficiency.

On transport, the authors propose a mixture of measures to raise the marginal cost of motoring, offset by increased investment in public (or now not so public) transport, and use of the planning system to prevent development that encourages car use.

Finally, the experience of regulation in the UK energy industry post-privatisation is dealt with, providing a good clear history of the whats and whys of the last few years. They recommend extending the

authority of the regulator: to promote greater energy efficiency, effect greater use of integrated resource planning and take more account of environmental considerations generally in the run-up to 1998.

This is a worthwhile report which covers the issues clearly, although I take exception to spurious examples of how markets can complement regulation. The fact that the dash for gas in the electricity industry has helped to reduce SO₂ significantly is pure serendipity.

With a price tag of £195, the report is obviously aimed at industry rather than the individual — a shame as it is well argued and written, and should be more widely read than will be the case at this price.

Chris Revie

* FT Energy Publishing, Maple House, 149
Tottenham Court Road, London W1P 9LL

Global

Climate change 1995: the science of climate change

J T Houghton, et al (Ed)

Cambridge University Press,
1996/1996, 572pp,

"THE balance of evidence suggests a discernible human influence on global climate."

This most revolutionary sentence in the latest IPCC (Intergovernmental Panel on Climate Change) assessment marks a new milestone in scientific understanding and outspokenness, and a far cry from the first IPCC report in 1990, which concluded that: "The size of this warming is broadly consistent with the predictions of climate models, but it is also of the same magnitude as natural climate variability."

Here, the scientists of the IPCC for the first time state their explicit belief in human-induced global warming. The inclusion of anthropogenic aerosols, in addition to the standard greenhouse gasses, into general circulation models (GCMs) — which are the most complex models of the climate system and developed for climate predictions — and subsequent comparisons with real-world

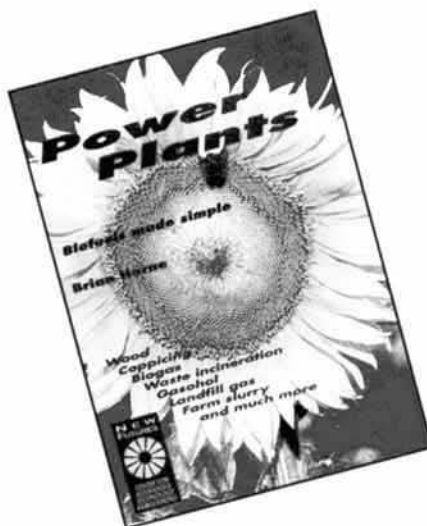
Energy grows on trees

**Power plants:
biofuels made simple**
by Brian Horne

Centre for Alternative Technologies
Publications, 1996, 62pp, £5.50

THIS book is an introduction to biofuels as a source of energy. It is clearly written and includes a number of case studies of working examples of biofuels from around the world, although I'm not really sure whether tyres count as a biofuel! The book is obviously aimed at the general reader, taking you right through the process from raw biomass to the services. The appendices provide a useful list of sources for those wishing to explore further.

There is a detailed description of a number of biofuel systems, what energy is, and the basic sources of fuels. A very



important topic, what people need from energy, is discussed, making the point that using electricity to provide heating is extremely inefficient: the best way to utilise biofuels is through direct heat provision. The various technologies used to tap into the bio-energy sources, from

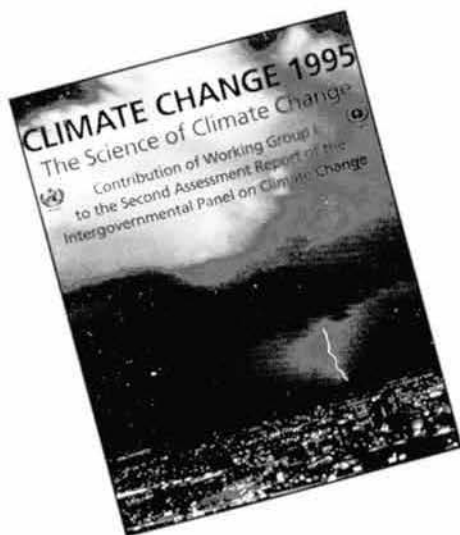
the simple wood stoves to industrial processes which produce ethanol are looked at.

The book touches on the variety of environmental and social problems that might be encountered with widescale use of biofuels. Biofuels could potentially run into similar problems to those of the wind industry unless people are aware from the start that although their impact is considerably less than those of conventional fuels they are not problem-free.

At only 62 pages the book only lightly covers this vast subject. However all the relevant areas are mentioned and the list of further sources of information is fairly comprehensive (though *The Safe Energy Journal* isn't mentioned). WorldWide Web sites and other internet locations of information are included. The book fulfils the subtitle on the cover — Biofuels made simple — by providing a clear introduction at a reasonable price.

Chris Revie

climate change is here — official



observations provide the main evidence for this statement.

Model results in terms of the climate response to anthropogenic forcing show good multi-dimensional (ie, as a function of latitude, longitude, height and time) correspondence to observed changes in temperature. Consequently, these analyses refute the argument that the observed warming over the last century is entirely due to the natural variability of the climate system.

This book is aimed at a multi-level audience. At one level, its policymakers summary reports the basic facts: quantitative changes in greenhouse gas emissions in the 1990s, a summary of the latest GCM results and very importantly estimates of future warming and consequent projections of sea level rise. It also informs the reader of the uncertainties associated with all the above and where improvements lie. A 35-page technical summary then gives a complete overview of these issues, complete with inventories, tables and diagrams which serve to provide information to be incorporated into policy statements. The chapters which follow these summaries provide a comprehensive text on climate change, including: quantitative radiative effects of greenhouse gases and aerosol particles; observations of current and past climate, both direct and indirect, and methods employed; climate modelling and GCMs; and future projections of climate change. The feedbacks in climate which preclude more definitive estimates of future warming from GCMs are discussed and a full evaluation and description of the latest GCMs provide an essential source of reference material for those who work in the field.

Overall, my biggest criticism of the book is that it is a little repetitive if read from cover to cover. However, this makes it easy to extract the relevant information in a nutshell. Much of the content appears to be new since the 1990 assessment, though some of it an update and some reiteration. The layout of chapter two is particularly amenable since it states what is new, updated and unchanged information since 1990.

The message is clear, anthropogenic climate change and future global warming is a real issue and its existence shouldn't be argued about any longer. All the information to convince anyone of this is provided.

The companion book in the series — *Climate change 1995: impacts, adaptations and mitigation of climate change* — provides a complete, in-depth report on the impacts of climate change and presents cohesive mitigation responses that should not go unheeded by governments. With such information to hand, preventing "dangerous anthropogenic interference to the climate system", as agreed by all member parties in article 2 of the framework convention on climate change, must be possible.

Ruth Doherty



Coming clean?

The Savannah River nuclear site in South Carolina is 630 square miles of radioactive contamination. As one of the US military's largest nuclear facilities, it faces a multi-million dollar clean-up.

Having produced tritium and plutonium for nuclear weapons from five reactors on the site, Savannah River has a long history of accidents and contamination. It also hosts around 70% of the nation's high-level nuclear waste, and aquifers under the site are contaminated with radioactivity from ponds of liquid waste designed to leak their radioactivity into the surrounding earth.

One of the contractors employed to carry out decommissioning at the site is a subsidiary of the UK's BNFL.

So, after 25 years at Sellafield, how does Dr Sam Kelly feel about taking on the job of heading BNFL Savannah River Corporation? "There is nothing at Savannah River I haven't experienced at Sellafield."



Selling BE short

With "a final burst of energy" the government successfully sold off British Energy, the 'profitable' part of the UK's nuclear power industry.

Well, not quite. It has now been revealed that 12.3% of the company remains unsold. While the offer to individuals — looking for the usual privatisation quick profit — was oversubscribed, city investors proved to be less enthusiastic. The level of the residual stake from this privatisation is unprecedented and means a shortfall in revenue for the Treasury of £165 million.

It has also emerged that the government was so desperate to sell the shares that the usual constraints on selling only to institutions of suitable pedigree were lifted — all that mattered was the colour of organisation's money.

For some sales this may have been of little relevance, but for the nuclear industry it would be reassuring to

know that the shares were in good hands. As *The Independent* less than subtly put it, "sitting in Whitehall it is impossible to vet the credentials of every investor in southern Italy."



Payment in wind

Dutch electricity generator UNA was not best pleased when Greenpeace activists painted "Stop CO₂" on a 185 metre high chimney at its Hemweg power plant in Amsterdam. After initially claiming Dfl2m (£775,000) for cleaning the giant graffiti from the chimney, the generator agreed to accept damages of Dfl80,000. However, UNA was further upset when Greenpeace attempted to make the payment by delivering a wind turbine to the power station. The offer was rejected and Greenpeace has had to pay up in cash.



Spin professor?

In the search for the spin doctor who conned all the national press into giving Sellafield an unwarranted all-clear for excess cancers in the area ("Cancer excess: cause unknown", SEJ109), suspicion fell on Prof. Bryn Bridges, chairman of Comare, the committee whose report didn't, in fact, let Sellafield off the hook.

He did give at least one briefing in advance of the report's publication — to the workers and management at Sellafield.

Prof. Bridges is sensitive to criticism of his impartiality. He recently took exception to an article in *Private Eye* magazine which described him as a government scientist. Bridges protested that he was independent and gave his address as Comare, University of Sussex. (The government quango is actually based at the Department of Health's offices in south-east London rather than the University where Bridges works when he's not being chair of Comare.)

And it took LBR several weeks of digging to uncover the professor's CV, even though it contains nothing more damaging to his reputation than that he worked at Harwell for eight years in the 1960s.



Screen saver, energy waster

A recent issue of the government's energy efficiency magazine *Energy Management* included a free computer disc with a screen saver program for PCs. The Green Screen, with cartoons by Larry promoting energy efficiency, cuts in when the computer is idle to prevent the screen 'burning out' because of a static picture.

Sadly, this feature over-rides the increasingly common automatic shutdown facility on computers which doesn't just save the screen but energy too — about 30kWh a year on a typical PC. If all 15,000 discs distributed with the magazine were installed and, as suggested, passed on to a few other people, that could mean 50,000 computers wasting a total of 1,500,000kWh/yr.



Representations

Trade body Eurelectric, supposedly representing Europe's electricity companies, has been doing a little less of the representing of late. Vociferous in its opposition to a proposed European directive to encourage electricity and gas distributors to help customers save on fuel use as opposed to building new plant, Eurelectric seem to have overlooked the fact that most electricity companies support the directive.



Inflated gas bill creates a stink

Little Black Rabbit was amused to hear of a clerical error by National Power (NP) which could cost the company £500,000. When buying gas from British Gas, NP agreed to pay 10.60p per kilowatt hour instead of per therm, committing itself to paying £530,000 for gas worth just £30,000.

NP is arguing that as it was a genuine clerical error, "we don't expect to have to pay the offer price." This is not a view shared by shippers on the 'flexibility market' where the purchase was made. One company commented: "We expect National Power to pay the money. We would challenge it in law if National Power was let off."

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Potential for energy saving in Ukrainian mining sector

THE ore mining industry in Ukraine has been, and will remain for the foreseeable future, one of the country's major export sectors. It will also remain one of the major industrial consumers of energy. Electricity consumption by the sector reached 13.0 billion kWh/year in 1990, amounting to approximately 5% of total electricity consumption within the country. This figure is equivalent to the annual output of over three 1,000MW power stations. In view of this, increases in energy efficiency in the ore mining industry will have a significant influence on the costs borne by the metallurgical industry, and indeed upon the overall efficiency of the industrial sector.

Guidelines have recently been produced for the sector, in the hope of reducing energy consumption in several key ways. By integrating a number of different methods, significant savings can be achieved, the most profitable of which are:

- 1) reprocessing the mining and processed waste, which, due to the poor methods used in the past, are considered to contain significant quantities of ferrous metals;
- 2) replacing electro-magnetic separators by magnetic separators;
- 3) using electro-thermic methods to crush magnetic ores.

It has been estimated that these steps could result in savings exceeding 3.0 billion kWh/year for the industry, and in other benefits resulting from a substantial reduction in environmental degradation and the cost of environmental protection. Whilst investment required to implement these measures would be large, it has been estimated that the pay-back period would be as little as four years.

In conjunction with these energy saving measures, the government has approved a significant reduction in iron production, enabling the industry to reduce its electricity consumption further.

In order to achieve these aims foreign investment is desperately needed. However, it is widely recognised that the legal and financial structure needed in order to attract investment to this and other Ukrainian sectors is inadequate and it will be necessary to:

- 1) protect investors legally via new legislation;
- 2) protect investors financially by establishing a guarantee fund;
- 3) set up banking depository and clearing systems, and establish a securities market;
- 4) upgrade the accounting, fiscal records and taxation systems to world standards;
- 5) carry out a joint environmental and energy-utilisation audit of the main technologies used within the country.

The mining sector is only one example of the poor energy efficiency standards which are severely affecting the competitiveness and profitability of virtually all of the country's industry. Only integrated legal, political, managerial, economic, scientific and engineering commitments will enable the required energy-saving goals in the country's mining, and indeed other, sectors to be achieved. These savings are desperately needed as Ukrainian industry is entering into the global market place.

**Dr. Victor Khazan &
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Editorial

A new project has recently been spawned by EASE in the Baltics. The project, 'Promoting Energy Alternatives in the Baltic States', involves partners from the Sustainable Energy Information Centre in Latvia, the Renewable Energy Centre (TAASEN) in Estonia and the Lithuanian Green Movement. With similar aims to EASE, the project will engender cooperation in the fields of energy efficiency and renewables between the countries of the Baltic States and strengthen links with organisations in other European countries.

Increasingly, innovative mechanisms are going to be needed in order to stimulate the market for energy efficiency measures and renewables. This issue of the newsletter focuses upon financial mechanisms which can be used to promote these sustainable energy policy objectives. As you will see, the Safe Energy Journal also has several articles on the same theme.

As part of the EASE project we are organising a major European conference to bring together organisations having interest in local energy issues. I hope that it will be stimulating to European and UK delegates alike.

Dr. John Green
EASE Co-ordinator

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Collection Loka foundation

www.loka.org

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Partnerships to finance Green Energy

“... the Earth Saver Account, a unique savings account designed to boost the development of the renewable energy and energy conservation industries in the UK.”

Anna Stanford

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RENEWABLE energy in the UK is at a cross-roads. Since 1990 the UK has had systems of support for renewables called the Non-Fossil Fuel Obligation (NFFO) and the Scottish Renewables Order (SRO), which, despite some drawbacks, have been successful in helping to kick-start an increasingly competitive renewable energy industry. However, the future is looking uncertain, as these forms of support are due to end in 1998 and there has been no indication of what, if anything, will replace them. This is in conjunction with falling research and development funding for the less-commercially viable technologies. And, from 1998 onwards, the UK energy sector will be opened to full competition, enabling all energy consumers, regardless of size, to choose from whom they will buy their electricity.

What full competition will mean for the development of a sustainable energy industry is uncertain. If the move to full liberalisation is accompanied by careful regulation to guarantee that environmental and social objectives are met, along with continued systems of support for the development of technologies, then competition in the market could offer some exciting opportunities for the development of renewable energy and energy efficiency initiatives.

Along with systems of support and regulation, significant private sector investment will be required, if over time, renewables are to become the main way of producing electricity instead of fossil fuels and nuclear power. With this aim, Friends of the Earth (FoE) continues to campaign to help develop a successful climate-saving renewables industry in

the UK and are working with the financial and private sector to take advantage of the opportunities offered by a liberalised energy market.

Already, companies are being set up to sell 'green power' and 'energy services' packages to individuals and organisations. There is a lot of work to be done, first of all, to stimulate public demand for green power, but indications are that a significant number of people are willing to pay more for sustainably-produced energy. Friends of the Earth is exploring how such demand for renewable energy can then be used to further drive investment in the run-up to 1998, and are already discussing how to work together with private sector companies.

Friends of the Earth is also working directly with the financial sector to transform the way we use and produce energy. In June FoE teamed up with Triodos Bank, a social bank lending exclusively to projects with social and environmental objectives, to launch the Earth Saver Account, a unique savings account designed to boost the development of the renewable energy and energy conservation industries in the UK. Like any other savings account, it will pay a competitive rate of interest, but unlike ordinary savings accounts, customers will know what the bank intends to do with the money. The bank anticipates raising £10 million which will be used to provide loans for renewable energy and energy conservation projects. The projects which are to be funded will all need to satisfy the guidelines developed by Friends of the Earth for sensitive development. Triodos also operates the WindFund, an investment fund for wind power, also supported by FoE.

FoE and Triodos are developing a joint marketing campaign to promote the Earth Saver Account to its members and local groups. To kick-start the fund, FoE England, Wales and Northern Ireland is depositing £200,000 of its reserves in the Earth Saver Account. FoE also benefits from the account, with savers having the option of donating their interest to FoE Trust to fund research on sustainable energy. For every account opened with £2,000 or more, Triodos will make a donation to either Neighbourhood Energy Action or FoE Ltd, depending on the wishes of the saver. A similar arrangement is presently being negotiated with Friends of the Earth in Scotland.

For more information on the Earth Saver account, please phone Freephone 0500 008 720.

ENERGY 21

**Sustainable Energy Opportunities and Agenda 21:
European, National and Local Initiatives**


Part funded by East Lothian Council
European Commission



Day 1: Energy Efficiency and Integrated Energy Planning

Day 2: Opportunities for Sustainable Energy Developments

Key speakers:

UNEP Regional Director for Europe

Lord Lindsay, Minister for Agriculture, Forestry and the Environment

Mr. Henningsen, Director DGXI, European Commission

Linda Taylor, Deputy Director, Association for the Conservation of Energy
Labour, SNP and Liberal Democrat Energy Spokespeople

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**Thursday 28th &
Friday 29th
November 1996**

**Marine Hotel
North Berwick
Scotland**

Cost: £220

Taxes and levies in Scotland

AS part of its work on the EASE project, Friends of the Earth Scotland will be hosting a seminar on energy taxes in September. The idea is to bring together environmental and social poverty action groups in order to agree a common policy on the form of energy taxation which would be acceptable and under what conditions such a tax could be implemented.

Levying a tax on energy has been proposed as a way of reducing carbon dioxide emissions and saving energy. It has several obvious attractions:

- the cost of energy conservation measures will become relatively cheaper;
- the relative financial savings from investing in energy conservation measures will become greater; and
- revenue can be used to fund other measures

It is clear, however, that an energy tax on its own will not automatically bring about a dramatic reduction in fuel consumption, or carbon dioxide emissions. As critics have pointed out, a relatively large increase in energy prices would be needed to stimulate a significant change in energy use behaviour, with energy demand being relatively inelastic. To be effective, therefore, energy taxes must form part of a package of measures to reduce consumption and emissions.

While taxes on the use of energy in industry and upon car users have been in place for some time, the issue of taxing energy use in the home remains contentious. Fuel Poverty (the inability to heat one's home to sufficient level of comfort because of lack of sufficient income) is a major problem in Scotland, and any attempt to increase energy taxes, which will have greater impact on these people than on other sections of society, is extremely unpopular.

However, the government recently imposed a V.A.T rate of 8% on domestic fuel in the UK. It was planned that this would be raised to the standard 17.5% V.A.T rate the following year, but following a successful campaign by various social action groups, the motion to increase the rate of V.A.T on domestic fuel was defeated. While this has meant that an increase in the fuel bills of the more needy has been avoided, it also means that energy conservation measures are presently taxed at a higher rate than fuel.

There are many objections to the present system of

taxes, including:

- V.A.T on domestic fuel and other taxes on energy in the UK are related to the monetary cost of a fuel, rather than to its energy content or to the amount of pollution that is released during use - they are therefore unrelated to the environmental impact of using a particular fuel;
- with the exception of petrol, they do not differentiate between different fuel types - no incentive is given for consumers to switch from a more polluting fuel to a less polluting one;
- hypothecation does not take place, missing the opportunity for revenue raised to target energy conservation measures.

The Government has introduced two hypothecated de facto taxes on energy consumption in the UK: the Non Fossil Fuel Levy (NFFO) and the levy to support the Energy Savings Trust (EST). The word levy being much less politically sensitive than taxation: it is notable, how much less of a fuss was made over these levies compared to that made by poverty action groups on V.A.T.

The debate surrounding energy taxes is, unsurprisingly, politically charged. The UK government has indicated that it does not foresee an energy/carbon tax being imposed in this country in the near future, as the UK is one of the few countries in the EU which will meet the Commission's target of holding CO₂ emissions at 1990 levels by the year 2000. However, through the introduction of fuel levies, the Government has shown that it is not adverse to raising taxes for specific purposes. The challenge is for it to be more bold in the targets that it sets.

The arrival of a Parliament in Scotland could add a further twist. Although, in its present proposed form, it would only have the power to alter the basic rate of taxation by a few pence in the pound in either direction, it is likely to have power over energy supply and, for example, the ability to raise a levy via the energy industries for the purposes of energy conservation.

It is not inconceivable that in the future, under a Scottish parliament, Scotland could be enjoying a lower level of income tax, whilst paying marginally more for its energy than the rest of the UK, and using this to implement programmes of energy efficiency and renewables expansion.

“... under a Scottish parliament, Scotland could ... implement programmes of energy efficiency and renewables expansion.”

Chris Revie

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Energy Supply Contracting

AS an alternative to conventional financing methods, Energy Supply Contracting provides an instrument for stimulating energy efficiency related investments by reducing to a minimum the risks to building owners, thus providing an incentive for upgrades. By giving the energy supply contract to a company which will install energy efficiency measures and in return keep the benefits accruing from the reduction in energy bills, the investment risk is taken on by the developer, who has the greatest knowledge of the risks and the benefits.

Home owners, for example, may not have sufficient capital to invest in energy efficiency measures, but in an Energy Supply Contracting scheme it would be the developer who would pay for the measures to be installed. They would receive payment as the building's owner continues to pay bills at pre-installation levels until the investment plus a fee have been covered by the actual savings.

A number of legal and ecological issues still need to be clarified, and Friends of the Earth Austria are currently in the process of

organising a platform to discuss the issues involved. To date, contacts with industry, governmental institutions, and citizen organisations have demonstrated that interest in such alternative methods is widespread. They are now looking for information, comments and opinion from other countries.

“Energy Supply Contracting provides an instrument for stimulating energy efficiency related investments.”

ALTHOUGH the rates of GDP growth and energy consumption have decoupled during the last 20 years, consumption in Austria is 15% greater than it was in 1973. Following a referendum held in 1979 the country has developed a non-nuclear energy policy, and

with environmentalists opposing new major hydropower developments, the increases have had to be covered by further imports.

Renewables account for almost 24% of the Total Primary Energy Supply in Austria, consisting mainly of hydropower (11.8%) and bio-mass (approx. 11%), a large proportion compared to most other European countries. Though their impact on energy statistics is still negligible (less than 0.1%), solar collector systems are gaining special significance in Austria, with more than 1 million square metres of installed collector area in 1994, representing 0.12 m² per capita. This impressive development is due primarily to a system of support established by regional NGOs to help self-organised groups to construct their own quite simple, but efficient, solar power systems. They are convinced that a similar scheme could work in many other European countries.

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EASE Seminars

Each partner is organising at least three seminars in their country for the EASE campaign. About half of the seminars have been arranged to date, including:

Austria

- Possibilities for a sustainable energy future in Austria and EU 18th October '96
- Presentation of practical solutions to regions and communities February '96
- Conditions for a national referendum on energy alternatives To be decided

Georgia

- “Assessing the environmental impacts of hydropower schemes in the Caucasian Region and how to limit risks” 26th June '96

France

- Social and environmental costs of electricity generation (provisional) To be decided

Lithuania

- “Transformation of the heating sector in Lithuania” (provisional) 3rd October '96
- “Energy efficiency and saving - Identifying problems and solutions in the implementation of an energy efficiency policy” 20th February '97
- “Development of alternative & renewable energy sources in Lithuania” 10th April '97

Scotland

- Renewable Energy Seminar involving all interested parties in Scotland 12th September '96
- “How can the effect of energy taxes on the poor be minimised?” 26th September '96

Ukraine

- Conception of Sustainable Development of Ukraine 1st July '96
- Ukrainian Energy Problems 18th July '96
- Energy round tables in Kiev, Dnipropetrovsk, Kryvyi Rih and Donetsk September '96

Acknowledgements

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