

ENERGY WORLD

The magazine of The Institute of Energy



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and the NFFO

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Editor
Johanna Fender

Advertisement sales
David Speculand, Adept, tel: 0472 388808; fax: 0472 388697

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COVER

This month's cover shows the centre section of a gas reheater for flue-gas desulphurisation (FGD), made by Howden Sirocco. Variants of the reheater are available for limestone/gypsum, seawater scrubbing and combined deSO_x/deNO_x systems for all major fuels, including hard and soft coals, oil and bitumen/water emulsions.



The third renewables order

THE publication, on 20 December 1994, two months behind schedule of the third renewable energy order (NFFO 3), provides the occasion for a review of the Government's programme to encourage power generation from sources regarded as broadly renewable.

The Government's policy for renewable energy dates back to the late 1970s and was set out in some detail in Energy Paper 55 in 1988. This paper envisaged a programme in three phases: the first — which had, in fact, already been completed — was an initial evaluation of all potential sources of renewable energy; in the second the Government would provide R&D support for all practical sources with a view to deciding which of them should be supported in the final phase which would bring schemes to the point where they could compete in the marketplace. Phase 2, which was scheduled for the mid '80s to early 90's, was a straightforward funding of R&D but how Phase 3, to be completed by 2000, was to be implemented was not revealed.

The privatisation of the electricity supply industry in 1989 provided, quite fortuitously, a mechanism for leading renewable energy schemes towards the market, few of them being, at that time, commercially viable. The method used was to purloin a small part of the non-fossil fuel levy imposed to provide a fund from which to subsidise nuclear power, and use it for paying premium prices for renewable energy. This was to be done in a series of tranches under which the various types of energy were marshalled into bands and contracts placed for specific amounts of power supply at a price struck for each band; the intention being that the price levels for successive tranches would be lowered to the market level by 2000. The Government also decided on a target of having 1500 MW of renewable energy in place by 2000. Contracts placed under the first two tranches — NFFO 1 & 2 — should have resulted in 576 MW of capacity being now in operation, but only some 340 MW actually materialised.

Some changes were made when the third tranche was announced in October 1993; the miscellaneous and sewage gas bands were dropped; the wind energy band was split into two — above and below 1.6 MW capacity. A new band of energy crops and agricultural and forest waste was introduced which was also sub-divided into 'energy crops/forestry waste gasification' and the enigmatically labelled 'residual (other)'. It is understood that the latter is mainly poultry litter.

Another significant change from NFFO 2 is that projects within a band will be paid at the price at which they bid into that band, rather than being paid the 'strike price' (the cut-off price above which bids are rejected).

Contracts placed under NFFO 3 ought to result in 627 MW

of capacity being commissioned, but the Minister, mindful perhaps of the failure of NFFO 2 to deliver the goods, only expects 'that around 300 to 400 MW ... are likely to go forward to commissioning'. That expectation belies the announcement in the tranche document that the three orders would result in some 900 MW of new renewable capacity becoming available.

The Government has a problem: to steer the Scylla of not getting the renewables prices down to market levels, and the Charybdis of not reaching its target of 1500 MW by the year 2000. It may need the wiles of Ulysses to keep the *Argo* carrying its renewable energy policy afloat; keeping too well clear of the whirlpools of Charybdis increases the danger of Scylla casting spells to keep the prices above market level. Since NFFO 3 was heavily oversubscribed one must assume that the bulk of the bids were at prices which would not have shown clear convergence with the market. If its own prognostications are correct, the Government will need to find another 800 to 900 MW at prices even closer to the market level in NFFO 4 and a possible NFFO 5.

The Government's and the renewable energy industry's aim of bringing prices down to the market level has not been made any easier by that level apparently having fallen by some 40% between the dates of NFFOs 2 and 3. One uses the word 'apparently' because of the difficulty of finding out what the current market price really is: if renewable prices are to compete in the market then it goes without saying that true market price must be clear to all, and the Government needs to address this point.

Even if the renewable energy industry manages to get its prices down to commercial levels there still remains the need for schemes to be able to obtain long-term supply contracts if they are to be able to secure the requisite funding. The NFFO scheme provides these contracts but, outside NFFO, the RECs have a statutory duty to purchase their power at the most economical cost and, on present showing, will be reluctant to offer long-term contracts whilst they are uncertain of future price levels.

To sum up, the Government's chances of achieving its twin targets of 1500 MW of renewable energy by 2000 and bringing prices down to market levels by that date do not seem to be very good. However, it has produced a mechanism by which the renewable energy industry — in its various guises — can test its ability to compete in the open market and it is now up to the industry to respond to that challenge. If, despite its best endeavours, the industry cannot compete in the market, it can then be debated whether it — of parts of it — should receive a modest subsidy for environmental reasons; but for the present the ball is in the industry's court.

R G Loram MInstE MIWM



Pakistan villagers wary of new dam

PAKISTAN is hoping a proposed new \$2.1 billion hydro electric power project will help boost the economy, writes *Ayesha Khan of Panos*.

But first it has to negotiate a World Bank loan and quell critics who say they do not trust the government's Water and Power Development Authority (WAPDA).

The Bank will not start talks unless other institutions or governments promise substantial support at the annual meeting of the Pakistan donors consortium, to be held in Paris in April.

Power will be generated by harnessing the water, diverted from the Indus river, as it rushes through a sloping, 58 km concrete channel between the villages of Ghazi and Barotha.

About 19 000 landowners will lose property if the water diversion channel and the 1450 MW power station, about 70 km west of Islamabad, are constructed.

Promises of compensation have not calmed opponents, who remember WAPDA's previous hydro dam in the area. The 1975 Tarbela Dam — at the time the

world's largest earth-filled dam — displaced more than 100 000 people and flooded 120 villages. The people were not compensated.

Zubeir Arshad, an activist in Ghazi, says residents, including about 100 families who moved there after they were displaced by Tarbela, are worried about the new project.

"We don't say that we are against power or against this national project," he says. "We say go ahead and build it, but the rights of the affectees should be granted."

Tarbela generated 3478 MW, disrupting existing services to some nearby villages and left much of the local area without electricity, even 20 years later.

This time, officials promise villagers and local development workers will be allowed to monitor implementation of WAPDA's promises to pay market value for the villagers' land, assist with resettlement, create a rural development programme and minimise environmental impact.

However, in the absence of strong environmental legislation

or a tradition of public interest litigation, observers have little faith the villagers will be able to hold the WAPDA accountable.

Another critic, the Sungi Development Foundation, which works at the community level, opposes the Ghazi-Barotha project on environmental, technical and political grounds.

Sungi argues that larger projects perpetuate top-down development with little community involvement, while small dams cost less, have fewer environmental and social consequences and ensure a more democratic development.

The irony of many such large-scale hydro projects is that despite the huge financial cost, there is little return to the local economy.

Major contracts for the Ghazi-Barotha plant's \$2.1 billion construction, plus an extra \$300 million in equipment, will probably go to US or European companies, because under World Bank criteria Pakistani companies are unlikely to be big enough to qualify for tender.

Regulator for South Africa

THE passing of the Electricity Amendment Act in November 1994 established a National Electricity Regulator (NER) in South Africa.

The NER has effective jurisdiction over all electricity producers and distributors.

The Minister of Mineral and Energy Affairs, Mr Pik Botha, announced the appointment of nine members of the NER, which will be chaired by Dr Ian McRae, formerly chairman of the Electricity Council.

The establishment of an industry regulator was welcomed by South African utility ESKOM. As part of its electrification programme, the company envisages 300 000 connections each year for the next five years, despite an announcement in November that the company's funding requirements will be 'modest' over that period.

EUFORES creation a boost to European renewables sector

EUFORES, the European Forum for Renewable Energy Sources, was unveiled at a meeting in Brussels on 1 February.

Establishment of the forum was decided on following a conference held in Madrid last March. It aims to attain an extensive representation of all interested parties in order to ensure that renewables contribute significantly to the EU's primary energy. The forum also seeks a greater coordination and consensus between all those involved, including institutions.

Its principal activities will be the implementation of an Action Plan for renewables, including dissemination and information activities, coordination with converging initiatives, such as the European Solar Council, UNESCO's World Solar Summit Process, and the organisations

Eurosolar, FEDARENE etc, as well as the organisation of meetings to foster the exchange of points of view.

The forum's governing body will consist of Mr Robles Piquer MEP as president, with Mr Anastasios Mandelis (Greek General Secretary for Energy) and Ms Eryl McNally MEP as vice presidents, and 16 members of institutions involved in the renewables sector.

The governing body is to proceed with steps step up the forum and develop its membership base. They will then invoke a first general assembly to confirm the statutes and deliberate about foreseen activities.

This should lead to the organisation of a new conference in 1996, which will set up targets, aiming to substitute 15% of conventional primary energy by 2010.

Energy Charter implications

THE Energy Charter Treaty, the biggest international investment treaty ever negotiated, has significant implications for energy investment, trade, transit, arbitration and environment in both OECD and former Eastern Bloc countries, according to speakers at a conference in London in January.

The Treaty is being finalised and scheduled to be ready for signature by participating governments. If ratified it will create the principal legal framework for investment in oil, gas and energy in all member countries. It provides a multilateral system of binding obligation on governments with respect to foreign investors, and all CIS energy investment will be intensely affected.

Under the Treaty it may be possible for individual companies to sue host governments for not providing 'national, non-discriminatory treatment'. This would include not providing equal access to oil and gas licenses and concessions, or for not opening up energy transportation facilities under dominant, controlling influence to competitors.

In the CIS, transit — currently the main barrier for energy investment in the region — will be considerably affected. According to Elena Kirillova of McKenna & Co, a speaker at the conference: "The question of transit is of vital importance. The current Chechen situation is related to the oil industry and transport through the region. Russia's ability to exert an influence in terms of transit has historically been a sore point for the republics."

She added: "A clear legislative structure is critical to foreign investment and although recent developments have been encouraging, the industry has repeatedly fallen victim to political lobbying."

Another speaker said: "It provides a lever by which producers and investors in the East can gain access to western markets" giving events in the East greater influence.



Sizewell B start-up at last

THE long awaited start up of Nuclear Electric plc's first, and maybe last, PWR finally took place at the end of January.

Originally expected in 1994, Lord Wakeham performed the 'switching on' ceremony.

Nuclear Electric hope to build a third power station on the site. The proposed Sizewell C would be of twin PWR design, but the go-ahead for the plant would be highly dependent on the results of the Government's nuclear review, the result of which has also been long-awaited.

NOx affects asthma victims

A STUDY published recently in *The Lancet* highlights the problem that nitrogen dioxide can adversely affect asthma sufferers in concentrations as small as those found in the home environment.

Previous research suggested that indoor NO₂ had a role in respiratory disease, particularly in children. In the new study researchers targeted their investigations on patients with mild asthma. They found that exposure to NO₂, at levels commonly encountered in kitchens with gas appliances, can exacerbate asthmatic responses to dust mite allergen.

The most effective and efficient way of combating the potentially dangerous build-up of NO₂ is the installation of a mechanical ventilation and heat recovery (MVHR) system. This provides control of air quality, and saves energy by recovering a high percentage of heat from the discharge air.

MVHR is widely considered to be the best way of reducing pollution and lowering the concentration of allergens in an indoor environment. For sufferers of asthma this would have a significant beneficial effect on their health.

Some European countries provide grants for the installation of MVHR on medical grounds, the UK is not among them.

Strong case for independence

FOLLOWING the unwelcome bid for Northern Electric plc by Trafalgar House, the board of Northern Electric has published a document setting out their case for keeping the company independent, and responds to a number of 'misconceived assertions' made by Trafalgar House.

Chairman of Northern Electric, David Morris, claims that Trafalgar House is trying to buy Northern Electric cheaply before the flotation of The National Grid Company, in order to take advantage of any increase in the value of the company's NGC shares. He believes the offer seriously undervalues

Northern Electric. Mr Morris also believes Trafalgar House have shown a lack of understanding of their business: "Trafalgar House does not appear to understand the factors which affect electricity prices, particularly to domestic customers. Both Northern Electric's distribution charges and supply prices to domestic customers are regulated. Any underperformance by Northern Electric in controlling operating costs would therefore be reflected in lower returns to shareholders, rather than higher prices to customers, as Trafalgar House mistakenly implies."

Own-generation limit debated

AFTER the publication of a consultation paper in December 1994, Prof Stephen Littlechild, Director General of Electricity Supply, has made a statement about the possibility of relaxing the own-generation limits on the regional electricity companies (RECs).

He said: "It would be reasonable to consider a REC's request to increase its own-generation limit on condition that it accepted explicit restrictions on the

contracts it signed with its supply business, and at a minimum would be prohibited from passing additional own-generation contracts into its franchise market.

"An increase in own generation, subject to such restrictions, could allow a REC to contribute more fully to the development of competition in generation without the allegation that it was exploiting its captive market and local monopoly position.

Pool price undertaking

ELECTRICITY Pool prices have been higher in the first weeks of 1995 than previously experienced. On weekday evenings (peak demand) the Pool purchase price has regularly exceeded 40 p/kWh. From 17.30 to 18.00 hrs on 23 January, it reached a record level of 63 p/kWh.

The main reason for the high prices is the level of the capacity element, added to generators' bid prices. This element varies with the level of available capacity on the system in relation to expected demand. Effective capacity has been less this year because the plant closed by National Power and PowerGen has more than offset new capacity coming on to the system. In addition, availability has been reduced

over the past few weeks by unplanned outages at Nuclear Electric's Heysham and Dungeness power stations, and National Power's coal-fired station at Eggborough. The result is that 40% of the recent Pool purchase price is accounted for by the capacity element, which has rarely been significant in the past.

National Power and PowerGen believe the situation might reasonably be described as 'exceptional circumstances', a clause included in the original undertaking given by the companies in February 1994.

Prof Littlechild is monitoring the situation closely to see whether the average annual price levels will be exceeded.

UK's first 'coppice' power station

THE first power station in the UK to be fuelled by willow saplings is to be built in North Yorkshire.

The project is a joint venture designed by Yorkshire Environmental, a subsidiary of Yorkshire Water in cooperation with the French and Swedish. Sweden currently meets more than 10% of its electricity needs from wood-burning power stations.

The plant will be built near Eggborough power station, near Selby, and will generate 8 MW.

Wind from South Wales

UNDER the latest tranche of the NFFO, South Wales Electricity (Swalec) is to build four wind-farms, at sites near Merthyr Tydfil, Llandrindod Wells, Fishguard and Haverfordwest.

The project will be executed by National Wind Power, a joint venture between National Power and Taylor Woodrow.

Once environmental studies are complete, planning permission will be applied for over the next year. Despite some opposition, Swalec believes the local population to be generally supportive.

Extending gas market competition

A JOINT consultation document on extending competition in the gas industry was published in January by OFGAS and the DTI.

The paper seeks views on the choice of initial area in 1996, and the nature of the second phase in 1997 (one or more geographical areas), with the proposed move to full competition at national level in 1998.

Copies of the consultation document are office from OFGAS, 16 Palace Street, London SW1E 5JD.



Advanced sealing technology for rotary regenerative heat exchangers

THE rotary regenerative heat exchanger has advantages in terms of compact size and relatively low weight, however, by nature of its design, it permits some leakage between the gas streams flowing through it. This can be tolerated if the quantity is known beforehand and is taken into account in plant design calculations.

It is much more difficult, however, to deal with leakage which increases significantly over the life of the plant. This phenomenon, commonly termed leakage drift, can adversely affect boiler operation, and has been widely experienced on a number of rotary air heater designs.

The Howden VN sealing system is an advance on previous technology and has been developed to reduce leakage drift to minimal levels.

Over a period of years, due to deterioration in the sealing system, air preheater leakage can increase, perhaps doubling in quantity. The figures shown are typical of experience on UK sites. In other countries there have been many instances where substantially higher leakage drift has occurred.

Leakage drift can have a number of adverse effects on boiler operation. Increase in air and/or gas flows result in higher draught fan power; higher velocities through the precipitator increase dust emission on coal-fired boilers; heat exchange is reduced if the boiler is operated with a fixed diluted gas outlet temperature; and coal drying in mills can be affected. In severe cases, excessive air preheater leakage can reduce the MW output of a power station.

The VN design concept

The Howden VN concept was developed in response to difficulties that power stations experienced with air preheater operation. Howden, in conjunction with the CEGB, embarked on a thorough programme of research and development to identify the

cause of these problems and to produce effective solutions.

Sealing was a major development area, in particular the elimination of many potential leakage paths and the doubling of the number of major seals.

In a rotary heat exchanger, the axial thermal gradient through the rotor causes it to adopt a domed shape. In older designs, adjustable axial and radial sector plates moved to follow this distortion in an attempt to minimise the gap between stator and rotor. Commonly the sector plates were under the control of sensors which measured this gap. This, however, introduced seals between the sector plates and the main heater structure. These seals were prone to attack by the flue gases and if they were damaged, permitted significant amounts of air to leak into the gas stream. Consequent ash build-up and corrosion of operating mechanisms behind the sector plates also affected the correct operation of the adjusting system.

Furthermore, a fault with the sensors or actuators could result in the sector plates being left in the hot running position. When the rotor cooled and moved towards the hot end sector plates, contact occurred, damaging the seals.

It was realised that whilst minimising the gaps between rotor and stator is theoretically a good idea, in terms of practical power station operation it is not the best option. The current Howden approach is to dispense with moveable sector plates and their associated problems and to accept the slightly higher initial leakage that this entails. Reduction in leakage drift is of far greater benefit to the plant operator.

As part of the development programme, the Howden VN sealing technology was retrofitted to a number of air preheaters on UK sites, with excellent results. Typically air leakage was reduced by 40% to 60% and held

at these levels between major outages (for up to three years). This success led to more stations adopting the technology and to date air preheaters on more than 10 000 MW of utility boilers in UK, Europe and North Africa have been upgraded.

The VN sealing system is now the standard option on new Howden air preheaters. In addition it has been supplied on 26 FGD gas reheaters, including those at Drax and Ratcliffe in the UK.

Other benefits

A consequence of the elimination of adjustable sealing systems has been a significant reduction in maintenance requirements. The replacement of seals, which have been worn, through contact with the movable sector plates, can be the largest item in the routine maintenance schedule. By using VN technology the period between major outages can be increased and the manpower required to carry out an overhaul is reduced by 40% to 60%.

The elimination of control systems associated with sealing requires less interfacing on the part of the main contractor.

Margins on fan duty or outlet temperature, which have been included top account for leakage drift, can be reduced.

If heat exchanger assessment is based only on initial design leakage values it may falsely penalise the VN design. However, if leakage drift is considered then it can be shown that the Howden VN evaluates better than an air heater design with adjustable sector plates which is prone to leakage drift.

A recent design study on a 600 MW oil and gas-fired pressurised boiler indicated the benefits of the fixed sealing system. At day one, the VN permitted slightly more air leakage than an actuated sealing system (7.1% against 8.6%). However, when the effect of leakage drift was considered, the marginal assess-

ment in favour of adjustable sealing was overturned. The effect of an average leakage drift from 6.6% to 8.6% reduced boiler efficiency by 0.06% and fan absorbed power rose by 4.5%. The inclusion of maintenance costs over the plant life showed an even better evaluation in favour of the VN design.

In conclusion, Howden investigations have shown that in regenerative heat exchangers, it is not leakage, but leakage drift which poses a problem. The use of a rotary heater with an advanced sealing system which is not prone to leakage drift can improve plant through life costs. Furthermore, this can lead to the use of lower plant margins and the ability to design for lower gas exit temperatures.

Joint partners in landfill plans

SEVERN Trent and East Midlands Electricity are joint partners in environmental schemes which are set to collect methane gas from landfill waste sites in order to generate electricity for the National Grid.

The waste sites are at Howden Clough, Morley near Leeds; Redhill, Surrey; Welford, Northamptonshire and Himley Wood, near Dudley, West Midlands.

Government approval for the proposals was granted under the recently announced NFFO, which encourages the use of renewable energy and fuels from waste in order to generate electricity.

Severn Trent and EME have set up a joint venture company: Biogeneration Ltd, to manage the landfill generation sites which are set to become operational by the end of 1995.

Biogeneration chairman, Mike Yates, said the joint venture represented a sound commercial and environmental proposition.

Severn Trent's waste management subsidiary, Biffa Waste Services, will use its expertise to construct gas collection systems, which will provide gas to the generators at the four landfill locations. Each will generate 1820 kW.



Demand-side management

— its potential in the liberalised UK domestic gas market

by Richard Pugh*

FOR the purposes of this article, the term 'demand-side management' (DSM) refers to specific actions financed by a utility to reduce energy demand by their customers. DSM has developed in the USA and was spawned as a reaction to the oil crises of the 1970s. Many lessons have been learned from the US experience in the electricity and more recently gas supply sectors.

A secondary responsibility of the Director General for Gas Supply (DGGS), Claire Spottiswoode, is to promote the efficient use of gas. In a recent OFGAS paper (*The efficient use of gas: the role of OFGAS*) the rationale for using the Energy Savings Trust (EST) to promote energy efficiency was undermined in favour of a purely economic and market orientated approach.

The view of the DGGS is that it is by no means straightforward to determine how much gas efficiency is economically justified. Consumers themselves are best placed to make judgements on the appropriate balance between costs and benefits. They do not need to be forced to participate in a scheme against their better judgements.

It is not OFGAS' duty to consider environmental factors in policy formulation. In undertaking a formulation careful evaluation and balancing of the environmental effects of various fuels should be required. This is especially true for gas which is a 'clean' fuel relative to other fossil fuels. Moreover, the DGGS feels she should give priority to the overall cost effectiveness rather than redistributive effects of energy efficiency.

Nevertheless, OFGAS believes that gas efficiency investment may today be inhibited by the current lack of competition in domestic gas supply. This monopoly means that independent providers cannot supply and bill for the complimentary products of gas efficiency and gas supplies. Subsidising British

Demand-side management (DSM) is widely recognised as a major mechanism for the promotion of energy efficiency. The following article examines the prospects for DSM in the UK gas industry as a means of improving energy efficiency in the domestic sector.

Gas efficiency investment can lower the profitability of independents and reduce their incentive to compete. At present, OFGAS can only consider E factor proposals put to them by British Gas, to whom ideas for any relevant schemes should be addressed.

The regulator has challenged the industry by reminding players it is often argued that there is a lack of available finance and an insufficient knowledge of the benefits for energy efficiency, which suggests that a market opportunity for financiers and others to use their marketing skills to promote energy efficiency offers an excellent money-saving investment.

Moreover, as the market develops, competing suppliers are likely to seek both to keep down prices and to keep down total costs to their customers by way of total energy packages. There could be merit in E factor schemes focusing on developing various gas efficiency services, which might be successfully offered in the market by independent providers when the gas supply market is open to competition.

In support of this vision, energy efficiency is one of the few circumstances where OFGAS foresees the need to allow supply contracts for domestic customers. This should, as it is intended, encourage gas suppliers to think carefully about developing energy efficiency products for customers.

One possible future development comes from the European Commission which has drafted a directive that would seek to encourage utilities in all members states to promote DSM in gas and electricity. Should this directive be adopted, UK policy on liberalised energy markets may need to be developed to take the requirement for DSM into account.

The US experience

Experience of DSM has been built up over

20 years in the US. However, from the results, the overall benefits are not obvious. In general US schemes have been utility applied, following enforcement by state Public Utility Commissions (PUCs). This approach is driven by planning push rather than market pull. The common problems associated with DSM schemes have been:

- programme costs are underestimated;
- programme impacts are under-stated;
- programmes create inefficient subsidies;
- programmes have unexpected distributional effects.

The US programme guaranteed the utilities a high return on their DSM expenditures (15% more than on their current ones). Therefore, they clearly have an incentive to over invest in DSM. In the current industry framework there seems little likelihood of the PUC approach being used in the UK gas industry.

However, there is another, more recent development in the US concerning DSM that may be more suitable for application over here. Energy Service Companies (ESCOs) have begun to emerge who sell DSM as a service and do not profit from any public incentives. Instead their incentive comes from gaining access to the energy efficiency surplus of avoided energy consumption.

Energy efficiency surplus

There is considerable evidence that energy customers do not use their own initiative, take-up economically viable energy efficiency measures, either through ignorance, perceived risk or high-marginal-rate rates of interest on existing debt. The consequence is a market failure between the supply and demand for energy. ESCOs can profitably exploit this characteristic, energy efficiency surplus, so long as their discount rate is less than the implicit discount rate for the customer.

These ESCOs can be subsidiaries of gas and electricity companies or simply vehicles to expand the market for third party finance. They offer contracts for heating, ventilation and air conditioning. Voluntary organisations cater for the needs of low income households, whilst profit-making companies market to the remainder.

Their contracts with the user provide either fully or partly guaranteed savings (in some cases, at least 80% of the forecast sav-

*Total Gas Marketing Ltd



ings are underwritten for energy savings insurance). Monetary savings are shared between ESCO and the customer.

The London Economics Study appraisal found the following advantages and disadvantages relative to the traditional DSM approach.

Advantages

- no cross subsidies, each scheme viability stands alone;
- the risks shared between the ESCO and customer;
- minimisation of consumer information costs;
- greater incentive for promoter to ensure sustainability of energy savings as the ESCO is bound to contract and profit is performance related;
- low regulatory overheads, schemes do not need to be heavily policed as with PUCs.

Disadvantages

- higher transition and contract costs, these projects are stand alone;
- consumer distrust of the intentions of the ESCO, there is initial mistrust of ESCOs moves;
- long-term contracts (of five to 10 years) tie down both ESCO and customer.

The US experience clearly shows that commercial and industrial programmes have in general out-performed residential programmes in terms of economic efficiency. This is largely because the fixed costs in the smaller end of the market are high compared to the value of DSM savings.

The most accessible cost-effective energy savings can be realised in the industrial and commercial sectors because of the size of potential savings and the lower unit transaction costs (which can be high when compli-

cated contracts need to be drawn up). Studies have shown that DSM in these sectors have saved at least half the cost of residential programmes, on a per-therm basis.

However, the record on systems savings has been disappointing across the board: since 1980, annual gas usage per customer has declined, while peak gas demands experienced on distribution systems have been relatively stable. The casual factors of small-scale energy use are not well understood (supplementary heat sources which are only operated during peak hours, thermostat setting changes during peak periods to improve interior comfort levels).

Moreover, gas supply is elastic in comparison to electricity supply. Instead of momentary balancing, the gas system tolerates balancing over the diurnal swing. This means that the load management produces less direct system benefits. Both these factors are important because to be really cost effective and cut the capacity requirements of customers, DSM schemes should ideally focus on reducing peak consumption.

The reform of the UK gas market has led to the separation of the roles of gas supply, (that involve the functions of marketing, gas trading and billing) from transportation and distribution. Supply is open to competition, while transportation and distribution of gas remains a monopoly, run by British Gas Transco, and regulated by OFGAS.

Competition is due to be introduced into the domestic sector in 1996, when 500 000 domestic customers from a trial region will be able to buy their mains gas from non-British Gas supply. By 1998, the whole market of 18.5 million customers will be open to competition.

Perhaps the major potential incentive of DSM to the gas supplier is that it would lead to lower capacity requirements and thus

reduce infrastructure costs. These capacity costs are determined on the peak day. A major use of firm gas is for heating which also makes up a large proportion of the domestic peak day load. Therefore heating efficiency and insulation are major opportunities for DSM as gas use is high and predictable, particularly in the domestic sector..

If DSM is to cut capacity costs then it must affect the peak day, and critically the transportation charging must reward that reduction. The current charging mechanism for transportation has a low level of definition with five entry zones and 37 exit zones. Moreover, many customers using below 25 000 therms per annum are deemed by the transportation charging mechanism to have a uniform 39% load factor. This tranche of customers includes all but the largest domestic residence, and also a significant amount of the small industrial and commercial sector.

This generalised charging mechanism does not provide any price incentives for either the gas suppliers or customers to cut their peak load. However, this situation may improve as the metering technology and charging mechanisms develop. Given the current situation, it is likely that DSM schemes applied to this sector will not be attractive.

Development of competition

Natural gas is an almost perfect commodity product. The twin factors of competition and over supply of natural gas into the UK market has recently led to margins on gas sales for suppliers to be driven down. This trend is expected, by OFGAS and others, to continue as competition is extended into the mass domestic sector. Increasingly, certain gas supply companies will have little oppor-

Table 1: Energy Saving Trust strategic plan — economic efficiency

From EST figures	Programme effectiveness			cost share subsidised by the EST	total cost effectiveness		cost appraisal per unit saved	
	total cost (million)	cost borne by EST for (electricity or gas) p/kWh	p/th		total cost per unit saved p/th	p/kWh	p/th	p/kWh
Homes 2000	£454	0.75	22	45%	49	1.7~~80%	39	0.3
social housing	£271	1.6	47	50%	94	3.2~~80%	75	0.6
affordable warmth*	£52	7.5	220	100%	220	7.5	220	
condensing boiler programme**	£27	0.5	15	17%	88	3.0	68	
residential CHP programme	£10	0.4	12	28%	42	1.4~~60%	25	0.6

*The target (200 000 low income households) is to compare with the 1.3m households burning less than 100th/a

**For small customers (<2500th). The average cost of a condensing boiler is £1200, while the maximum subsidy is £200.



tunity to compete on price, since they share similar cost bases, associated with largely shared production and transportation facilities, as each other.

In the face of a highly competitive environment, niche suppliers may, as OFGAS expects, look for means of moving competition away from commodity competition towards products that offer service differentiation. DSM promoted by gas supply companies may prove an attractive means of developing a form of differentiation.

Given that system benefits cannot be realised through the current transportation framework, other sources of benefit need to be reviewed to justify DSM in the domestic sector. Energy efficiency surplus is a potential means of utilising the blunt nature of transportation charging to promote DSM.

In the developing de-coupled gas supply framework, the promotion of total revenue from the sale of gas that accrues with the ESCO is relatively small (less than 5% of the selling price for small 2 500 therm customers). This opens the opportunity for supply companies to encourage energy efficiency among their customers in order to gain access to the energy efficiency surplus of avoided supply.

In theory at least, provided that DSM measures save energy at a cost below the incremental cost of energy, there will have been a net increase in welfare as less resources will have been used to provide the same level of energy services. ESCOs can use their advantage of direct links with the customer over other agents in the gas supply chain to utilise this surplus.

However, the cost effectiveness of DSM schemes in practice has yet to be proven. Table 1 shows the results of a cost analysis (by Bruno Henri of Total) on the EST's main programmes. Clearly, there are the only projects, Homes 2000 (of 39 p/therm) and the Residential CHP programme (of 25 p/therm) which have produced savings anywhere near the marginal cost of gas supply that is around 22 p/th (the approximate cost of gas at the beach). However, these values are below the value of gas to the customer (BG domestic

tariff price is 45p/therm excluding VAT) and so there is an opportunity for ESCOs to utilise the value of the energy efficiency surplus generated by these schemes.

Nevertheless, given that savings from capacity reductions are not obtainable, it demonstrates the scale of the economic hill that would need to be scaled in order to produce a cost-effective DSM package for ESCOs to market to the domestic sector.

Marketing

Assuming DSM promoted by an ESCO were to prove viable in the UK gas market, the implementation of ESCO-led DSM needs to be undertaken in the light of detailed market research and trials. Various means have been used to promote DSM among customers in the US and elsewhere. These range from tailor-made solutions for larger customers, to a more standardised approach for smaller customers.

A strategic goal of energy marketing may be to move towards contract energy management, although care and caution would need to be shown alongside demonstrations of imagination if these products' development is to be successful.

Clearly, projects that provide synergy benefits to complimentary utilities such as electricity and water savings will allow the implementation costs to be spread, although the aims of joint schemes might become clouded.

Tangible DSM products could vary in their level of complexity from simply providing information to the customer, such as an energy audit, or helping with capital for an energy efficiency investment by means of a loan paid back by means of the gas bill. Opportunities for DSM may become apparent in various circumstances such as retrofitting energy efficiency incentive programmes and new construction programmes.

In all cases, the ESCO must ensure that there is an identifiable and recoverable means of adding value. In common with all marketing actions to the domestic sector, unit costs for promoting, implementing and verifying DSM must be minimised. Moreover,

unit cost is a powerful issue and becomes a major influence over what can be made viable in this sector.

In the currently envisaged gas supply industry, there are few incentives for suppliers to promote DSM to the domestic sector. This is for two main reasons: first the transportation charging mechanism takes no account of customers specific load factor, unless the domestic residence is large enough to use over 25 000 therms per annum. Second, the non-system incentives covered largely by energy efficiency surplus are outweighed by the large fixed costs associated with supplying gas to small customers, matched by the high fixed costs of serving them with an additional service package.

Fundamentally, DSM in the small sector of the industry does not appear to be economically efficient, unless external factors such as social costs are taken into account. The aim of liberalised markets is to supply gas to the market in the most economically efficient manner. However, within the current framework, supply-side options have an overwhelming advantage over those of the demand side.

In order that DSM be given an opportunity in the domestic sector, Transco should take proper account of demand side opportunities when it considers plans for development and maintenance of its system. To be relevant in this matter, the DSM programmes should be able to reward customers through their gas suppliers for reductions in peak demand. This would enable domestic gas supply to move towards equity between the supply and demand options.

It is not obvious at all that the EST programmes provide system benefits. Moreover, DSM funded by energy conservation surplus alone, offers only very limited viability. To be really cost effective for small customers, the DSM schemes should focus on reducing peak consumption, which is a major cost for small customers (and British Gas Transco's main source of profit) and be rewarded for doing so. □

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YOU can't see it, you can't smell it, hear or taste it — but it kills. Health and Safety Executive (HSE) figures testify to between 30 and 40 deaths from it a year, but it is widely acknowledged that the true figure is probably much higher.

Carbon monoxide (CO) poisoning cases highlighted in recent months have largely involved students, living in short-term rented accommodation. And indeed this is one of the groups most at risk, as are the old, the unemployed, those living on benefits. But CO poisoning can affect anyone living with a gas appliance.

For years the problem has gone on, virtually ignored by government and interested groups alike. It was finally brought to wider public attention by the Gas Safety Action Group (GSAG), a voluntary association of bereaved relatives and people who have suffered non-fatal CO poisoning themselves.

In October last year the Government announced it was to tighten up safety laws in an attempt to curb the growing number of cases of CO poisoning from faulty domestic gas appliances. The changes force landlords to take greater responsibility, with a legal obligation to service equipment on an annual basis using a CORGI registered installer. Landlords found to have dangerous appliances in their properties now face large fines, and in extreme cases, jail sentences of up to two years. Some campaigners feel this is still too light a sentence for what, in some cases of negligence, is tantamount to manslaughter. Before the new safety measures, which came into force in November 1994, landlords could only be prosecuted under housing regulations, with successful prosecutions carrying only a small fine.

Carbon monoxide is a by-product of incomplete combustion caused by inadequate ventilation, faulty appliances or faulty flues. It can occur in an appliance burning any of the fossil fuels, but the overwhelming majority of cases involve natural gas.

Although CO is impossible to detect by eye or smell, there are danger signs to look out for: gas burning with an orange flame, signs of soot or a sooty or musty smell, brown or black discolouration or signs of scorching on any part of the appliance. HSE statistics suggest this most commonly occurs with domestic boilers, gas fires and cooking appliances.

A Gas Consumers Council (GCC) report, *Unsafe flues* published in September 1993, identified specific building problems under three main headings: poor construction, poor design and use of incorrect materials. 'Poor construction' highlighted several problems:

The invisible killer

by Johanna Fender

Carbon monoxide poisoning kills at least 30 people a year the true death toll is probably much higher. *Energy World* examines the problems and its possible solutions.

mortar not cleared from precast flues, reducing the size of the flue and causing turbulence; construction debris not cleared, reducing the catchment area behind the appliance, and crossed flues, where the flue gases from one house escapes through the flue of the neighbouring property.

On the design side, undersized flues were found in loft space: a problem often missed, as few installers inspect the loft when testing a flue prior to installation. In addition, the use of an incorrect mortar mix causes joints between flue blocks to deteriorate, allowing flue gases to escape into living space.

In its recommendations, *Unsafe flues* advises improving quality control in the building industry, via the Building Regulations, giving inspectors the option to inspect flues during the construction process, as is already the case with housing foundations and drains.

There is a strong case for further dissemination of information about CO poisoning, particularly to the medical profession. HSE statistics show deaths from CO poisoning over the last eight years as being fairly stable, between 30 and 40 a year, although their figures for 'non-fatal incidents' have shown a dramatic increase, from 85 in 1986/7 to 213 in 1993/4. These 'non-fatal' cases could just as well be described as 'near misses' or 'lucky escapes', as in many instances, victims are discovered just in time to avoid a fatality, and such poisoning can result in permanent brain damage.

The GCC report found that the medical profession itself agrees that the symptoms of CO poisoning are not always recognised. In a highlighted case, a doctor reported that CO poisoning would not have been attributed as the cause of death of a couple had their dog not been found lying dead beside them. Consequently no recorded statistics can be viewed as accurate, and the actual death toll could be much higher than currently thought.

Symptoms range from fatigue and headaches to dizziness and nausea, and are commonly confused with 'flu symptoms. Kate D'Lima, a journalist from Kent, received #2400 compensation from British

Gas after suffering CO poisoning from a boiler serviced regularly by the company. She had been very close to death, yet neither her own doctors, ambulance personnel nor staff at an accident and emergency department suspected the cause.

Before it disbanded, the GSAG campaigned for the introduction of reliable CO detectors, as an additional safeguard, on top of basic measures, which may to many seem like common sense, but are overlooked by millions of people. The basic precautions are: only buy an approved appliance, have it installed by a CORGI-registered engineer, with annual maintenance checks, and the regular sweeping of flues and chimneys to ensure adequate ventilation. The Government's recent TV energy efficiency campaign, encouraging the public to stop all draughts and so save on heating bills, could have included the warning not to block ventilation devices, but it didn't.

Experiences of some GSAG members have shown that these precautions are not always enough. One member's entire family suffered CO poisoning over a period of years from a gas boiler installed and maintained by a CORGI registered engineer: in a case of similar circumstances another member's son suffered permanent brain damage. With a gas as difficult to detect and as dangerous as CO, perhaps the only ultimate precaution is a CO detector.

These have recently appeared on the UK market. However, as yet there is no national standard covering these devices. This is urgently needed, and is currently under consideration by the HSE. British Gas do not recommend the use of CO detectors, which they claim are unreliable and unproven. Indeed an unreliable CO detector is worse than none at all, as it instills a false sense of security: hence the urgent need for a British Standard.

British Gas instead recommend that those fitting new installations should choose one with a balanced flue. In theory the balanced flue system drains fresh air from outside the dwelling, allowing fumes to flow out the same way, with the unit sealed off from the



room. In practice there are doubts too about this system.

Research carried out by BSRIA in 1993 gave grounds for concern that in certain conditions flue gases from the terminals of balanced draught appliances, sited at low level, can enter neighbouring windows and accumulate to concentrations which could be hazardous.

British Gas safety advertisements have concentrated on the risk of explosions from gas leaks, yet say nothing about the far more common danger of CO poisoning. However, a recent initiative by the company has helped the situation: they have written to GPs explaining the symptoms of CO poisoning and how to recognise it.

Some progress has been made in recent months towards cutting the incidence of CO poisoning, but sadly it is not enough. It should be the role of engineering institutions involved in the energy sector, such as our own, to put pressure on all the relevant authorities: to improve Building Regulations; to press for a British Standard for CO detectors; and perhaps most important of all, to increase awareness.

CO is invisible, but its results are not. It is up to us to make the horrendous effects more visible, both to the medical profession and to the general public. Only then will the need-less tragedies stop. □



A CO detector

Heat exchanger markets impacted by recession

DESPITE its wide usage throughout industry and commerce, the heat exchanger market and manufacturing industry have suffered from the effects of the recent recession, in common with most other types of process equipment.

According to a new report by international market research publisher Frost & Sullivan, the total European heat exchanger market (including the whole range of equipment used for heat transfer and heat recovery in Western Europe, in industrial and commercial applications) is estimated to be worth \$3318 million, forecast to increase to reach \$4063 million by the end of the study period in 1999.

The widespread usage of heat exchangers throughout industry and commerce has protected the market from the worst effects of this recent recession.

The importance of heat exchangers analysed by the report does, of course, vary widely from sector to sector amongst the end-users, with the largest end-use share of the market being that for the chemicals industry, currently valued at \$774 million.

The next most important sector is the market for food and beverage processing, worth \$540 million, followed by commercial and institutional uses and utility services, worth \$475 million and \$447 million respectively.

Fastest growth is expected to be experienced in the market for general engineering, as the whole of the industrial economy begins to recover and invest in new and replacement equipment. This sector is forecast to rise from its 1994 level of \$260 million to reach \$335 million in 1999.

Assuming that there is no change in the politics of oil supply, the lowest growth rate

is forecast for the fuels processing sector, predicted to grow by only 13.9% over the period under review.

In terms of equipment, the heat exchanger market is dominated by those designs which have a basically tubular shape to their heat transfer surface, expected to comprise over two-thirds of the overall market by the end of 1994.

However, the shell-and-tube exchanger is still by far the largest segment of the market, currently worth \$1432 million, predicted to reach \$1719 million by 1999.

The segmental growth rates are forecast to vary quite widely from the low values of 20% — from 1994 to 1999 — for both tubular exchanger segments, to high values of 26.2% for air coolers, and almost 27% for plate-and-frame exchangers and waste heat boilers.

The main market trend will continue to be the market share capture by plate heat exchangers from the shell-and-tube segment, as the plate heat exchanger manufacturers continue to develop their designs into higher pressure operations. □



THE Department of Economic Development (DED) in Northern Ireland, in line with UK Government policy, announced its intention to encourage the development of commercially viable renewable sources of energy, as part of a total energy strategy.

This strategy is intended to embrace energy efficiency, environmental concerns and energy conservation policy, as well as promoting diversification and reduced dependence on fossil fuels. The privatisation of the electricity industry in the UK created a timely opportunity to provide a new stimulus for renewable energy. In England and Wales this was coupled with a levy scheme, designed to help fund the excess costs of renewable energy projects, and enable them eventually to take part in the new competitive electricity market. The NFFO regime has led to a substantial growth in the number of wind, hydro, biofuels and waste-driven generating facilities commissioned since privatisation.

Following the sale of the existing fossil fuel power stations and its own recent privatisation, Northern Ireland Electricity plc (NIE) is the only transmission company and public electricity supplier within Northern Ireland. With the privatisation of the Northern Ireland electricity industry complete, the DED announced its intention to place a NFFO on NIE, requiring it to secure an amount of power from renewables sources. The size of the obligation was pronounced as about 15 MW dnc initially, rising through the placing of successive NFFOs to an aggregate of about 45 MW dnc by 2005. The experience gained in operating the NFFO regime in England and Wales has been valuable in devising the arrangements for Northern Ireland. However, the arrangements for Northern Ireland are different, in a number of significant respects, from those in England and Wales.

Existing renewables

Renewables energy from various sources has been used in Northern Ireland for centuries. Traditionally windmills and water-wheels were employed widely in local agriculture and industry. Recently newer, more sophisticated technologies have begun to make an appearance in Northern Ireland.

**Power Planning Department,
Northern Ireland Electricity plc*

Renewables in Northern Ireland

by Andrew McCrea*

The Institute of Energy's Northern Ireland branch chairman, Andrew McCrea outlines the background to renewables in the province, explaining the arrangements instituted to encourage commercial exploitation of renewable energy, and highlights the differences from the NFFO regime in England and Wales.

These range from small run-of-river hydro schemes to wood and animal waste burning boilers and wind turbines. In 1990, NIE erected a demonstration 300 kW wind turbine at Slievenahanaghan in Co Antrim and has more recently installed a small wind-diesel scheme at Rathlin Island, a community which until then relied on kerosene lamps and diesel generators. However, the existing schemes are only harnessing a small amount of the renewables potential.

A recent and respected study of the potential for renewable power in Northern Ireland was completed in early 1993, as the result of a three-party study (NIE, DED and ETSU for the DTI). This report was published in order to highlight the opportunities to potential investors in projects for the Northern Ireland NFFO.

The potential contributions made by different renewables are found to vary both in magnitude and cost. In the short term (by the year 2000) contributions are possible from wind, biofuels, waste and hydro, but there appear to be no opportunities from tidal, wave and geothermal resources.

For many renewables, environmental and economic considerations will limit the rate of uptake of the resource. In Northern Ireland the technical problems associated with integrating some renewable generators into the grid are also important. Wind energy, for example, would be currently limited to about 160 GWh/y, due to the possibility of grid control problems from such an intermittent source. Experience from integrating renewable energy sources into the distribution network may show that further incorporation is possible at a later date and indeed plans have been made for studies to investigate this possibility.

In the short term contributions could come from wind, biofuels, waste and hydro, as these technologies not only represent a significant resource at a reasonable cost, but are

also ready for deployment. There might also be some uptake of passive and active solar technologies, displacing some of the need for fossil fuels for heating purposes. The maximum estimated contributions for electricity generation by the year 2000, together with estimates of the installed capacity in MW from the different renewable resources and indicative lifetime costs (in p/kWh) based on a 15% real rate of return are summarised in Table 1.

A key consideration, which until now has restricted the development of renewable schemes is the higher capital cost per installed kW as compared to fossil fuel generation. These costs should reduce if renewables are exploited on a larger scale, both through economies of scale and the evolution of more efficient technologies, which would result from increased experience of renewable energy. The NFFO is intended to enable renewables projects to be installed and operated within the new competitive structure of the electricity industry. This should help create increased confidence in renewables amongst manufacturers, generators and the financial community.

NI NFFO scheme

The Electricity (Northern Ireland) Order 1992 mirrors to a large extent the provisions of the Electricity Act 1989, Article 35 of the order enables the DED to make an order (the 'NFFO Order') requiring NIE to make such arrangements as will secure that the aggregate amount of generating capacity available to NIE from non-fossil fuel generating stations will not be less than the amount specified in the NFFO Order. This 'will secure' test places an exacting statutory duty on NIE, the penalty for breach of which can be a fine.

The DED indicated to NIE that it intended to make the first Northern Ireland NFFO Order in the spring of 1994. In order to deter-



mine which projects were available to take part in the first NI NFFO, NIE held a public tender. The results of the tender were used to inform the Department's decision on the size of the NFFO, and the split between the various technologies.

In August 1993 NIE, DED and OFFER (NI) held a seminar in Belfast for prospective renewable generators where the details of the NFFO competitive tendering process was described in detail. Scheme documentation was produced as 'Information Notes for Generators', 'Tender Pack Guidance Notes' and two questionnaires.

The process was in two stages, culminating in contracts signed by generators which contained binding quotations for energy to be supplied (in p/kWh) and dates when the plant will be available to NIE. These contracts are evidence to the director general for electricity supply in Northern Ireland (DGES) that NIE have made necessary arrangements referred to in Article 35.

The first stage of the tender process involved proposers completing and returning a technical and planning questionnaire by 30 September 1993. This was designed to provide NIE with preliminary data on the scheme. The questionnaire addresses such matters as the type of technology proposed and its viability, the location of the proposed site, planning permission, consent and other necessary authorisations. It also requests sufficient data to permit a connection cost to be evaluated for each scheme.

Tenderers who completed the initial questionnaire satisfactorily, and who received a connection cost quotation from NIE then made a business case submission, assisting NIE to establish the financial and commercial viability of the scheme. These were returned by 31 December 1993, and contained each tenderer's binding bid price for each unit of electricity which they proposed to supply to NIE. Each tenderer also executed the appropriate standard form power purchase agreement, which constituted an irrevocable offer capable of acceptance by NIE.

The contracts

NIE prepared three standard varieties of power purchase agreement, depending on the size of the facility and the services it can provide to the NIE power system. Each agreement carries a number of provisions, necessary to ensure compliance with the NFFO Order. For example, the generator grants NIE the sole and exclusive right to the contracted capacity. This is important to ensure the facility is available to enable NIE to meet the 'will secure' requirement. The generator must use reasonable endeavours to generate whenever it is practicable to do so. In addition, although the contract recognises that certain schemes may require a small amount of fossil

Table 1: Prospects for renewables development in Northern Ireland

Renewable technology	max established contribution (MEC) by year 2000		MEC expressed a % of total demand	Indicative lifetime costs at 15% real rate of return
	(GWh/y)	(MW installed)	(%)	(p/kWh)
wind (land-based)	160	50	2.5	5.5-8.0
biofuels				
energy crops	160	20	2.5	8-9 (4-5)
biogas				
sewage sludge	19	2	0.3	3.5-4
farm wastes	10	1	0.15	9-10
energy from waste	160	20	2.5	3-11
hydro (small-scale)	30	6	0.5	4-10
Total	540	100	8	

fuel for start-up and boiler stabilisation purposes, the use of fossil fuel is strictly limited.

The generator is paid for metered output, less an amount in respect of any electricity which has to be imported. There is a two-part calculation necessary to arrive at the amount that the generator is entitled to be paid. First, the adjusted energy price is arrived at by taking the bid, or base energy, price, which will be derived from the generator's tender, and indexing that price to the change in the RPI before adding the season and time of day weightings (STOD). The STOD weightings are designed to provide an incentive to maximise output during times when the capacity has most value to NIE, and minimise output when it has least value. The generator is paid the adjusted energy price for each unit of metered output up to a defined maximum.

Even the best conceived and managed renewables project has elements which are beyond the control of one or both of the parties, such as the risk of not getting the appropriate permissions, consents or authorisations or of becoming insolvent. To impose these kinds of risks on NIE would make the 'will secure' test a very exacting test indeed, and one which would be impossible to meet. Fortunately, as is often the case with laws, there is the rule and there are exceptions. The exceptions permitted by the NI NFFO Order are in two categories. The first, 'conditions precedent', relates to those projects which make it through the tender process, but do not become operational for one of several reasons specified in the NFFO Order, namely:

- the granting of all necessary permissions and consents;
- the parties entering into a connection agreement;
- the generator being authorised to generate by licence of exemption; and
- the commissioning of the facility.

The second category, the 'termination provisions', relates to those projects which do become operational, but then hit problems. These could be terminated for one of the following reasons:

- the generator ceasing to be authorised to generate;
- the generator being in material breach of its obligation under the contract; and
- the generator becoming insolvent.

These specified 'conditions precedent' and 'termination events' required to be carefully reflected in the contracts or power purchase agreements which NIE entered into with successful tenderers. If the contracts contained any conditions precedent of termination provisions other than those specified in the NFFO Order, NIE would risk being in breach of the 'will secure' obligation.

The Northern Ireland electricity system is small compared to that of England and Wales — peak demand is about 1500 MW with minimum demand on a summer night as low as 300 MW, and a total system energy demand of about 6500 GWh/yr. Northern Ireland is not currently interconnected with any other electricity system. Further, the number of conventional power station units connected to the system at any given time is small, and the loss of a single unit can cause loss of supply. Indeed the loss of a power station could lead to the total collapse of the entire system. The load curves for typical days in any season show that the maximum demand is approximately twice the minimum demand.

For these reasons, NIE as transmission system operator has to meet a number of challenges, which would not be relevant in other, larger power systems. For example, a limit is placed on the percentage of total demand at any moment in time which can be met by a single generating unit. In addition, a margin of reserve is carried on operating



units to minimise the impact of the loss of a generation infeed. The NIE power purchase agreements carry special provisions which are designed to ameliorate the impact of renewable power on the system.

The use of STOD factoring is common to all versions of contract. The aim to encourage the renewable generators to generate on winter days at peak periods, but discourage them from generating on summer nights, when they could cause system operational problems. STOD weightings are also designed to encourage maintenance and outage periods to be scheduled in the summer months.

The three types of contract are principally distinguished by the size of the facility they are designed to cover, and the support that facility can give to the NIE system.

The type A contract is designed to accommodate smaller schemes of less than 1 MW, with the generator running whenever possible.

Type B contracts are aimed at wind farm installations, and for schemes of equal to or less than 5 MW. The unpredictable nature of wind and associated problems this causes for the transmission system operator, has meant that it is necessary, at this stage, for NIE to limit wind farms to a maximum size of 5 MW installed capacity. This contract gives NIE the power to disconnect a facility when the additional power, or power fluctuations, could compromise the safe or efficient operation of the system. Provided it was able to generate, the generator is nevertheless paid, as if it was delivering metered output during periods of disconnection.

Type C contracts are aimed at schemes which can offer support to the NIE system at times of disturbance. This generally applies to facilities, other than wind farms, of up to 10 MW. These contracts enable NIE not only to disconnect the generator, as with type B, but also to allow NIE to instruct the generator to maintain a particular level of output. Such schemes will normally run at full output, but at times of system disturbance, they may be instructed to facilitate the control of system frequency. Generators will be paid as if they were generating at full output during these periods, again assuming that this was possible.

There is a further difference from the NFFO arrangements in Great Britain, and that is the absence of a non-fossil fuel levy in Northern Ireland. There is no levy because at the moment there is no wholesale supply competition in electricity. Under the current regulatory regime, all generators must sell their output to NIE's power procurement business. This electricity is then offered to electricity suppliers at the Bulk Supply Tariff

rate (which is price regulated). Suppliers can only buy at this rate, and only from NIE. The cost of purchasing non-fossil fuel generation to meet a NFFO is therefore passed through the Bulk Supply Tariff to suppliers, and thence to customers. No levy is therefore necessary.

Provision has been made in the regulatory regime for wholesale supply competition to be introduced at some stage in the future. It is not yet clear what form this, if introduced, may take. However, it is possible that any such arrangements could involve the introduction of a levy system.

Proposal development

Following the call for proposals from renewable generators, a total of 64 developers returned the completed part one, technical and planning submission to NIE by the deadline. Before final submission to part two, the financial and economic stage (at end of January 1994) there were a total of 51 schemes remaining. 45 schemes completed both phases, and these schemes all tendered contracts with a bid price for contracts of up to 15 years. The 19 schemes which had dropped out had done so for a variety of reasons.

Seven types of technology were tendered: biogas, biomass, sewage digestion, sewage incineration, municipal waste incineration, small-scale hydro and onshore wind.

An NIE technical and financial commentary on the 45 schemes was presented to both DED and OFFER (NI). OFFER (NI) independently commissioned an economic and financial assessment of the schemes based on the information provided by NIE.

The tenders were assessed on their overall technical viability, for the proposed contract lifetime, and the quoted project lifetime. Some submissions proposed developing existing schemes: one hydro power project proposed the use of an existing 50-year-old turbine as the prime mover. This turbine is likely to be nearing the end of its design life: whilst it is likely to last the 15-year NFFO contract duration, it is unlikely to survive the 50-year quoted project lifetime. In some cases information was insufficient for a full assessment to be made.

The load factor for each scheme was calculated and assessed. The load factor ratio compares the tendered energy yield to the maximum energy yield available, if tendered output was available for all 8760 hours of the year. It assumes that all of the annual energy yield is taken by the grid, and is defined as:

$$\frac{\text{tendered annual energy yield (kWh/a)}}{\text{tendered capacity (kW) } \times 8760 \text{ (h/a)}}$$

The maximum load factor, therefore, is one.

Typical reasons for the load factor to be less than one are: seasonal availability of resource; and plant outages (breakdown, servicing and maintenance). Plant efficiency was accounted for within the tendered capacity figure.

The NI NFFO technical questionnaire required proposers to state the anticipated forced outage rate; planned outage rate; net plant availability; full power availability; estimated net annual energy yield, and tendered capacity. The tendered data was used to check the soundness of the proposers' load factor estimates.

The final selection

The 1993 NI NFFO Order was made by DED on 31 March 1994, and required NIE to sign a total of 20 contracts with 12 different companies, mostly based in Northern Ireland, to provide 'environmentally friendly' electricity in compliance with NI's first NFFO.

The decision to approve contracts with renewable generators for a total of 15.6 MW dnc, (32.2 MW installed capacity) represented the culmination of a process which began in the summer of 1993. Three technology bands are represented across the spread of schemes, which cover all six counties of NI. There are six wind schemes of around 2 MW dnc, each totalling 12 664 kW dnc (29 451 kW installed capacity); five sewage gas projects totalling 560 kW, and nine small-scale hydro schemes totalling 2 374 kW capacity.

Two of the wind schemes will be located in Co Antrim, with two in Co Tyrone, one in Co Londonderry and one in Co Fermanagh. Four hydro-electric schemes are planned for Co Antrim, three in Co Armagh, with one each in Co Down and Co Tyrone. Sewage gas schemes are planned for Counties Antrim, Down, Londonderry and Armagh.

The first NI NFFO has successfully attracted a wide range of renewable electricity generation schemes onto the Northern Ireland power system. This tranche resulted in 20 contracts representing 15.6 MW dnc of capacity, which is roughly one third of the Government's long-term objective (45 MW dnc by 2005). The average bid price to be paid to generators is around 6 p/kWh. The average price of power generated by NI's thermal power stations is 2.5 p/kWh.

It is anticipated that Government will soon place a second NFFO on NIE with contracts being signed in Spring 1996. This second tranche will most likely target technologies which were not available or failed to promote successful tenders under the first NFFO. □



Coal comes full circle

by Peter Heap

ON a chilly spring morning in April 1944 I waited, with six other shivering Bevin Boys, outside the manager's office at Sherwood Colliery, Mansfield, to be 'welcomed' to our first pit jobs. After about 20 minutes we were ushered in by a fawning manager's clerk who told us to take off our caps in the presence. The manager glowered at us: "You didn't want to come; I didn't want you. But now you're here, by God I'll see to it that you WORK."

They were the only words he ever addressed to us in four years at his pit, but they summed up the attitude of almost the entire management of the coal industry to the reluctant greenhorns conscripted into the wartime pits.

It was lucky for us that the miners didn't share that view. True, they didn't think we'd make any difference to the abysmal output of coal that threatened the war effort. But they welcomed us, treated us with kindness, took great care of our safety, and looked after our welfare. I, for one, had my life completely changed by being accepted into one of the closest-knit communities thrown up by the industrial revolution.

Coal was on the brink of public ownership. Even the old regime despaired of its resurrection without Government aid. When nationalisation came in 1947 there was hope that all the old animosities could be buried and a new partnership forged between men and management.

At first it seemed to work. Joint consultation was embraced by both unions and management, and conciliation machinery pointed to a way out of the endless petty disputes which had bedevilled coal for generations and dragged its efficiency down. But old attitudes died hard. Although the unions welcomed some of the benefits of power, they were denied — or sometimes rejected — matching responsibility. Too much responsibility remained ultimately in the hands of ministers and as governments came and went the Coal Board found itself a football in the political struggles of the day. Colliery management remained autocratic, unwilling to do more than pay lip service to the notion that men who worked at the coalface might have a moral right to determining matters which vitally affected their own lives.

Coal — Cecil Parkinson's 'ultimate privatisation' — is now back in the private sector. For almost half a century of nationalisation it was never far from the centre of the political stage. Throughout that time Peter Heap saw the parade of events at first hand, starting as a Bevin Boy in 1944 and retiring from British Coal as Senior Press Officer in 1987. He is now PR adviser to Coal Investments plc. Last October the Bevin Boy's Association invited him to their annual reunion to tell them of his experiences and look at coal's future prospects. This is what he told them.

Yet in spite of much mutual hostility, technical progress was made. It was recognised very early by the men's most foresighted leaders that mechanisation, far from being a threat to miners' jobs, was the one sure way of increasing their earning potential, improving safety, and taking the drudgery out of the old hand-getting methods of mining. They cooperated with a will in the introduction of machine mining. When the pits had been in private hands, the most advanced faces were still only using chain cutters, first introduced from America in 1916, and pan or belt conveyors. Most coal was still shotfired and loaded by hand. Productivity was only one ton per manshift — a tenth of what it is today.

The setting up of engineering research establishments and the willing collaboration of machinery manufacturers sowed the seeds of a mechanical revolution. There were, of course, a few false starts and one or two blind alleys. Notable white elephants included the Samson Stripper and several generations of coal ploughs which proved hopeless in most British seams even though German pits had used them with success.

A breakthrough came with the first shearing-drum loaders. They solved the problem of cutting and loading from a solid face in one action. Mounted on armoured flexible conveyors they reduced the area of exposed roof between the virgin face and the goaf and cut the incidence of roof falls. Coupling them with self-advancing hydraulic roof supports which also moved the flexible conveyor into

its new track as the shearer proceeded, the British coal industry had come up with a winning combination for producing large and continuously-flowing supplies of small coal exactly suited to the needs of the growing electricity generating industries around the world. British longwall face kits were exported to almost every advanced coalmining industry around the world, notably the US, Australia, India and China. The techniques were widely copied in Germany, Poland and Russia.

Hand-in-hand with the benefits mechanisation brought in productivity came an even greater boon — a steady decline in accidents. At nationalisation fatalities were running at 600 a year. By the time full heavy duty mechanisation took over in the '80s, fatal accidents were down to a handful, and there was a matching dramatic reduction in serious injuries. It not all due to mechanisation, of course. Sustained research into the causes of fires and explosions, for example, led to a greater understanding of the mechanisms of dust and methane explosion. The need for more efficient ventilation led to the adoption of larger, smoother-sided roadways. The potential fire hazard of trunk conveyors was largely eliminated by replacing rubber belts with modern plastics.

In 40 years the industry had been turned round from a doomed, ramshackle relic to become one of the world's most advanced bulk energy producers, employing technologies adopted around the globe.

At the same time, there had been parallel development in the electricity industry, where the ever growing demand for power led to larger and larger power stations. The generators along the Trent had an insatiable appetite for coal, each station capable of devouring the entire output from four or five collieries. In 1947 only one sixth of the coal mined in Britain went to power stations; by the late '80s at least three-quarters was turned into electricity. But meeting demand meant that coal became over-dependent on one market: the electricity tail tended to wag the coal industry dog. Capital investment in mines, machinery and equipment was made with an eye all the time on the requirements of the Central Electricity Generating Board.

It was an over dependence on one market that proved to be the coal industry's Nemesis. Privatisation of the electricity supply industry was accomplished in such a fashion that coal which had once dominated the primary fuel supply became only the residual legatee,



excluded from the open market place by a ring-fenced nuclear industry and exclusive take-or-pay contracts which fuelled the 'dash for gas'. Regional electricity companies avidly signed up to 15-year contracts in their eagerness for independence from the two big generators — precisely the kind of long-term contracts which had been denied to the coal industry and which might have saved big chunks of economic coal production from premature extinction, Coal paid the price for its myopic fascination with the ESL.

Not only the pits dedicated entirely to the electricity market suffered. Many collieries which had traditionally supplied domestic fuels, industrial and commercial grades and specialist process fuels now found themselves out on a limb, because without power stations they had nowhere to dispose of the high proportion of small coal that was inherent in the universal adoption of mechanised longwall coal faces.

It has become the paradox of the 1990s: while pits and power stations overflow with stocks of unburned home-produced coal, homes, factories, schools and hospitals are having to take supplies of coal mined half-way round the world, because the pits that could have produced the coal from beneath our feet have been closed by a bizarre distortion of the market place economy.

The days of coal as the major supplier of energy in Britain are over, at least for the foreseeable future. But that should not be taken as a signal to write the industry's obituary. If only for strategic reasons, there will have to be a substantial continuing proportion of generating capacity relying on coal well into the 21st century. And those alternative markets which have been sacrificed by British Coal on the altar of electricity expediency are still around and will continue to require substantial quantities of fuel.

Coal can look forward to a future of diversity. For the moment, niche markets will sustain those collieries capable of adapting quickly to changes in mining technique and coal preparation.

The way ahead is already being mapped out in the handful of pits, closed under the great shutdown of October 1992, which have been transferred under licence to the private sector, ahead of the main privatisation of British Coal. The resurrected pits, mainly in the Midlands and Yorkshire have adopted a new regime: simplified, flat management structures with only a minimum of layers between the coalface and the board table; less rigid working practices, with every miner capable of doing other men's jobs; the adoption of flexible room-and-pillar coal-faces to replace the conventional longwall; machines which will cut a greater proportion of large coal (the continuous miner has been very successful in Australia and the US and is being introduced into Britain); electric

shuttle cars operated in wide, roof-bolt supported roadways for speedy transfer from coalface to main transport systems; a genuine partnership in which mineworkers, managers, and shareholders have equal status in the financial decisions of the company through share option schemes for workers as well as profit-related pay.

Such measures will ensure that coal is in the strongest position to compete in the cut-throat energy markets now developing around the world. There is at least a second chance to create genuine partnerships. Us-and-them attitudes can begin to disappear as they should have done in 1947, if only the politicians of the day had recognised that substituting the State for the old coal owners could do nothing to repair the hostility, endemic in the industry after generations of exploitation, unless a genuine sense of partnership came from shared privilege and shared responsibility.

This is not to advocate workers' cooperatives; they could not function effectively in the mining environment. Certified managers must have the freedom to manage if they are

to carry out their legal responsibilities for the safety of the men and the pits in their charge. But instead of being autocratic captains as in the past, the new generation of managers is already demonstrating that management in consultation works much more effectively than management with confrontation. A new spirit is reportedly manifest already, because the mineworkers understand that they have an entirely new status as partners and shareholders in the enterprises in which they work.

In a little under 50 years the coal industry has come full circle. From control by the old coalowners to state monopoly in the public sector and now back to private ownership. But not back, thankfully, to where it started. Technologically, coal mining is a thousand light years away from where it was half a century ago and, as a result, is well equipped to compete. There is an almighty struggle to come. Against alternatives, it may or may not survive, but it has its best chance in the hands of a new breed of managers and entrepreneurs who have a refreshing vision of the way ahead. □



The author, Peter Heap, began his career in the coal industry as a Bevin Boy during the war.



Internationalisation

A conference report by Johanna Fender

THE Institute took one of its four themes (internationalisation, convergence, sustainable development and life-cycle analysis) as the title of its last conference of 1994.

As always an impressive cast had been assembled, with top-level speakers from most of the major energy utilities. The keynote address was given by Energy Minister, Tim Eggar MP.

Conference chairman David Jefferies CBE began proceedings with his introduction, and was followed by the Minister. The first session was titled 'business opportunities and strategy', a subject addressed by Ed Wallis, Chief Executive of PowerGen; Cedric Brown, Chief Executive of British Gas; and Mike Hughes, Chief Executive of Midlands Electricity. Mr Brown pointed out that internationalisation is increasingly seen by the utilities as an answer to loss of market share in the UK following privatisation of monopolies. Whilst Ed Wallis held up the recently-completed new CCGTs as a 'shop window' for the international market.

The second session was called 'Project Planning and Assistance'. Graham Hadley, MD of National Power's International Business Development, took the first spot. He saw the strong reputation of the CEGB's

The Institute of Energy saw out the old year with a conference of global proportions, in subject matter at least. Internationalisation was chaired by President David Jefferies CBE, in London on 1 December 1994.

international arm, BEI, as a great advantage to the privatised power generator. He spoke of the many pitfalls encountered by National Power over the last three years, and of the patience required, as many projects do not come to fruition ("you have to kiss many frogs to find a Prince").

Barry Stokes of British Gas Global and Bernard Dewe Mathews of J Henry Schroder Wagg & Co Ltd gave different perspectives on the approach to project planning.

Following a three-course, sit-down lunch the delegates were kept on their toes by lunchtime speaker Sir Alan Cockshaw, who is chairman of the Overseas Project Board, who encouraged interested companies to seek the aid and expertise of the Board.

Five speakers addressed the afternoon's topic of Business Opportunities for Suppliers. These were Dr Terry Harrison, Chief Executive of Rolls Royce; JOh Hood, Managing Director of Weir Pumps; Peter

Hensman, MD of Gilbert Gilkes and Gordon; John Cull, development director of AMEC Mechanical & Electrical Services, and Graham Atkinson, who is Head of Projects in the Department of Trade and Industry's export division. □



Graham Hadley of National Power's International Division gives delegates the benefit of his company's experiences.



Tim Eggar, Minister for Energy, (left) listens with interest to the morning's deliberations. Right, Peter Johnson (IoE President elect), John Holroyd (Chairman, IoE Executive Committee), and Dr Terry Harrison of Rolls Royce take stock of the morning's events over coffee.



Obituary

Dr R G Temple

A THANKSGIVING service for the life of Dr R G Temple was held on 14 November 1994, at the Church of Holy Ascension, Mappleborough Green, Warwickshire.

Gerald, as he was better known to his many hundreds of friends, was born in Edgbaston, Birmingham, in December 1927, and obtained his Doctorate in Chemical Engineering at the nearby University of Birmingham.

He gained considerable industrial experience at Midland Tar Distilleries; International Furnace Equipment and the National Coal Board, where he was Head of Furnaces, Kilns and Heavy Clay section of the Midlands Technical Marketing Department. Around 1967 Gerald joined the staff of the Department of Chemical Engineering at the University of Aston.

During his 21 years at the University, Gerald became Senior Tutor, a sub-Dean and Chairman of the Senior Common Room. Within the Institute of Energy, Gerald was well known as a visiting lecturer at Handsworth College and the Chance College of Technology, Smethwick, where he lec-

tured part time in the fields of fuels and fuel plant technology to great success, and was responsible for many members joining the Institute. During this time he became Chairman of the Midland branch, and has subsequently been its Educational Representative.

For many years Gerald was also a member of Council and Chairman of the Education and Training Committee. When he relinquished this post he continued to serve the committee as Chairman of the Degree Accreditation Committee, and was also the Institute's representative with the Engineering Council. His guidance and council will be sorely missed.

If any epitaph is required for Gerald, it must be that he never made an enemy and only saw what was good in people. Consequently he made many hundreds of friends, and his students will long remember that he gave freely of his time, and that his encouragement inspired many to better things.

Our condolences go to Joan, his partner in life for 42 years, and his family.

D E A Evans

Hon Secretary, Midland branch

Contact: Mr S Wilce, tel: 01454 201101

Northern Ireland

Thursday, 16 March

Annual Dinner, Culloden Hotel.

Contact: Mr A McCrea, tel: 01232 454336

North Western

Thursday, 16 March, 6 pm

'Modern Strategies in Industrial Pollution Control' by Dr T Donnelly, Unilever Research at Thomson House, AEA Risley, Warrington.

Contact: Mr E Curd, tel: 0151 231 231 3617

North Eastern

Wednesday, 22 March, 5 for 5.30 pm

Joint seminar with Institution of Gas Engineers, British Gas Engineering Research Station, Killingworth. Speaker & title tbc.

Contact: Mr A W Potts, tel: 01670 712861

North Western

Thursday, 23 March, 5.30 for 6 pm

'Developments in High Performance Insulation' by Dr R Hill, Micropore.

Contact: Mr E Curd, tel: 0151 231 3617

S Wales & West of England

Thursday, 23 March, 7 pm

'The THORP Reprocessing Plant at Sellafield' by Mr R Warren, BNF plc. School of Chemistry, University of Bristol. **Must be booked in advance.**

Contact: Mr S Wilce, tel: 01454 201101.

Energy Minister to speak at InstE lunch

TIM EGGAR MP is to be the principal guest and speaker at The Institute of Energy's Annual Luncheon.

The venue for this year's luncheon will be the Cafe Royal, Regent Street, London, on 4 April.

Applications for company tables and individual tickets can be made by telephoning 0171 580 7124. Ticket price is £48.00 plus £8.40 VAT (total £56.40).

The list will be closed on 21 March.

Engineers' Environmental Management Initiative

AN Environmental Management Initiative to encourage engineers to give priority to cutting the UK's energy costs is being launched by the Institute of Energy, together with the Engineering Council in partnership with the Energy Efficiency Office and ETSU and the Management Charter Initiative (MCI).

Environmental management is a major challenge facing engineers. It is estimated by the EEO that 20% of the nations' energy costs are wasted. Successful environmental management can lead to significant cost savings from engineering operations as well as reduced insurance premiums. In addition it enhances the career development for engineers.

The Engineering Council's Code of Professional Practice on environmental issues highlights the importance of this for engineers and recommends action to be taken. In partnership with ETSU, for the EEO, the Council is carrying out a project to establish a programme on environmental management. This will assist engineers to analyse their professional development needs in this area, and provide information on available learning resources and guidance on access to NVQ assessment.

The project is sponsored by ETSU and will build on the national standards being developed and tested by the MCI and the EEO together with the Institute. Managed by the Engineering Council, the programme is being developed by Pointing Consultancy Services, and material is planned to be available in late summer 1995.

Involvement from interested employers and individuals is welcomed in developing and testing the programme. For further information contact Louise Evans, at the Institute of Energy, 18 Devonshire Street, London W1N 2AU, tel: 0171 580 7124.

Branch events

North Western

Date to be confirmed

One-day seminar 'Fire Safety in the Process Industry'

Contact: Mr E Curd, tel: 0151 231 3617

London & Home Counties

Thursday, 2 March

The Government's view of energy, provisionally at The Royal Institution

Contact: Mr J Burke, tel: 0171 332 1883

Midland

Thursday, 2 March, 7 pm

'Demand-side management' by Mr P D Benstead (Manweb plc). Snr Common Rm, University of Aston, Birmingham

Contact: Mr D E A Evans, tel: 01384 374329

Northern Ireland

Tuesday, 7 March

Joint seminar IoE & Institute of Physics, 'Energy Options in the Next 50 Years' by Prof Ian Fells, University of Ulster at Coleraine

Contact: Mr A McCrea, tel: 01232 454336

S Wales & West of England

Wednesday, 8 March, 5.30 for 6 pm

Young Persons' Papers Evening, SWEB Aztec South, Almondsbury, Bristol.

Contestants from industry and academe present current projects and compete for a prize of £150.



Essential reading for architects

'Solar Energy in Housing Design' Volume 1: Principles, objectives and guidelines; Volume 2: Examples by Simos Yannis. Published by Architectural Association Publications, London, 1994.

BY the design of the built form, the specification of materials and the distribution of fenestration with respect to orientation, the energy requirements for heating, lighting and cooling buildings can be minimised.

Within the UK the Government has funded, initially through the Department of Trade and Industry, an extensive programme of research and development on such passive solar design techniques. This has been complemented by a number of examples of leading-edge approaches to low energy house design being constructed and their performance monitored in the context of the Commission of European Communities' Energy Project Demonstration Scheme, and subsequently the THERMIE programme.

The reports on the individual projects in these various initiatives have filled the shelves of research specialists in the field. To date, however, this wealth of information has not been distilled into a readily available form, of use to practising architects. These two volumes seek to remedy this in relation to house design. They represent a highly reliable formal statement of the current canon of knowledge with respect to passive solar housing design in the UK.

The first volume outlines design plans and environmental design requirements before addressing issues of site layout, built form and internal planning. The third part of the first volume develops design criteria and guidelines for windows, opaque elements, ventilation and air tightness. It also considers conservatories and heating systems and controls. This volume concludes with a discussion of the appropriate use of design support tools. A manual calculation method based on the calculation of gain-to-loss ratio and auxiliary heating fraction is presented and a worked example provided.

The second volume provides a detailed discussion with plans, graphs and photographs of twenty-seven schemes. These include seven detached houses, eight estates, five terraced housing schemes and seven apartment blocks. All but five of these examples are in the UK. It is interesting to note that Milton Keynes is the home to seven of these case studies. Two examples are unbuilt design studies. Illustrations are lavish with generally very high quality photographs. The text stresses the architecture of the buildings, rather than the physics of their operation. It

is a book with which designers should feel very much at home. It should do much to encourage them to delve deeper into the more technical content of the first volume. The performance of the buildings presented is compared, and achievable targets of energy performance and carbon dioxide emissions developed. The only issues that are not addressed are those of refurbishment of existing dwellings, and the economic viability of the schemes presented.

This two-volume publication represents essential reading for housing designers, and if disseminated widely, could have a profound impact on new housing design.

Professor Brian Norton

Authoritative viewpoint

'The Politics of Coal's Decline: the Industry in Western Europe' by Michael Parker, published by the Royal Institute of International Affairs and Earthscan, London, 1994, £12.95.

IT IS now a commonplace that the events which have shaped the coal mining industry in Britain over the past ten years, and have culminated in the final privatisation of the industry, flowed from the Conservative government's political aim of breaking the power of the National Union of Mineworkers and its confrontation with the miners in the year-long struggle of 1984-5.

As a first-hand witness to and participant in many of the stages through which the process has gone, Michael Parker, Director of Economics at British Coal until 1991, has a uniquely authoritative vantage point from which to survey the prospects facing the hard-coal mining industry of Western Europe.

He sees the political influences in Britain almost as a mirror of the policy-driven fortunes for the rest of European mining. He points out that now the OPEC threat appears to have receded while gas supplies seem abundant, political influences which supported coal have virtually disappeared, to be replaced by environmental pressures.

He says that coal's long-term market is now likely to replace the ageing conventional power plants. But the present R&D programmes are insufficient to allow this to happen. There is no evidence that any EC/EU environmental regulation at present in force would limit any member states' ability to use coal against its government's wishes, but in the other hand it is highly unlikely that the Commission would intervene in the market to protect coal from its environmental disadvantages. Nor would any member state seek to do so except in support of a policy to protect indigenous production. It has certainly

never been seriously possible that there could be a centrally directed Commission policy to protect indigenous production, simply from the lack of any common interest.

Mr Parker illustrates the lack of common interest by contrasting government policies towards coal in Germany and the UK, which between them produce more than 80% of the European Union's hard coal. In the UK there has been rapid contraction and privatisation; in Germany massive subsidies and slow adaptation by consensus. Spain has used selective restructuring and subsidies, while France has opted for a slow phasing out. The 'Anglo-German anomaly' is striking because the broad aim of German policy is to sustain by subsidy deep-mined production possibly twice that likely to survive in the UK, even though costs could well be three times the British level.

'This market divergence of policy can be explained only by wide differences in domestic politics,' he writes. 'In the UK, the Conservative government's political aim irreversibly to break the power of the NUM has had no parallel in Germany; and in Germany, the checks and balances of the federal structure have sustained the influence of coal-producing regions, whereas in the UK there are no such regional checks of sufficient influence to mitigate the rigour of central government policy.'

Mr Parker concludes that if there were another nuclear accident, if alarm about the security of Russian and Algerian gas supplies were to grow, if global warming were no longer thought important, then the politics of coal could be changed sufficiently to stimulate investment in the new coal-fired generation. But he sees as the most important issue continuing to be the politically acceptable phasing of coal decline: a process governed by domestic politics operating within the subsidiarity principle. That is a political, not an economic concept. The outcomes in Britain and Germany have been so different as to strain the bounds of credibility — until we remember the politics, he says.

Peter Heap

Training and management

'Occupational standards for engineering professionals' Published by EnTra, Watford, 1994, £50.00

'Standards for managing energy-management standards' (final draft) available from Management Charter Initiative, Russell Square House, 10-12 Russell Square, London WC1B 5BZ.

THE Institute has recently been sent two



publications which will be of interest to members. In 1990 The Engineering Industry Training Board (EITB) started to develop occupational standards for scientists and technologists. The work was continued by the Engineering Training Authority (EnTra) which succeeded the EITB in 1991. The target group for the proposed standards were expected to hold at least a first degree or equivalent in engineering.

An initial analysis indicated that people in the group would be likely to be working with a high level of responsibility in at least one of the following eight areas: R&D; engineering design; engineering manufacture; installing commissioning and testing; maintaining for operation; marketing and selling; project management and systems engineering.

A working party was established for each area of work whose task was to define the key functions within the areas and prepare occupational standards for them comprising elements of competence, associated performance and underpinning knowledge and understanding.

The resulting publication, *Occupational standards for engineering professionals*, is a comprehensive work running to some 250 pages. It is written in simple, comprehensible terms — no unintelligible management jargon is used. It is clear and concise, analysing each job and function in detail: of great value to those in engineering and process industries who are concerned with recruitment, training and preparation of job specifications.

Smaller companies considering setting up departments or employing specialist staff will also find the publication a useful reference work. It deserves wide application in any industry employing engineers and scientists.

Standards for managing energy-management analyses the competencies required by all those involved in managing energy. It defines the key purpose as 'to ensure the effective management of energy resources to meet the organisation's objectives'.

The standards proposed reflect the breadth of functions undertaken by managers of energy resources, including purchasing and advising on energy issues, initiatives and regulations.

The performance standards are grouped into four main areas of action. These are to develop, implement and review strategy for the management of energy; to support improvements which increase the effective and efficient use of energy; to evaluate, enhance and promote the organisation's performance in maintaining and controlling energy usage; and to manage the financial aspects of the supply and consumption of energy.

Each area is then further divided and

analysed in detail under the headings of performance criteria, range, essential knowledge/skills and evidence specifications.

The standards have been produced following wide ranging consultation, and therefore are based on existing (albeit perhaps best) practice.

The background knowledge and skills required implies education to at least degree standard although this is not stated in the text.

Those responsible for managing energy will need to have at least a background knowledge of a wide range of topics, including fuel type, fundamentals of heat transfer, mechanism of heat flow, energy auditing, management techniques and skills and financial awareness. The ability to communicate effectively is emphasised throughout.

The standards are now being tested in a wide variety of organisations to check their validity and application. The final version, taking into account comments received, is expected of such people and therefore will also help in job analysis, identification of training needs and recruitment.

A step forward

'Domestic energy and affordable warmth' published by E&FN Spon for the Watt Committee on Energy, 1994.

THIS study, the fruit of a two-year working group under Prof Tom Markus of Strathclyde University, marks a big step forward in facing up to the severe problems of poor housing, fuel poverty and resultant ill-health in Britain.

Out of 23 million households, some eight million have inadequate heating — two-thirds of these are rented and one-third mainly elderly owner-occupiers — being badly insulated with high heating costs, but with family income too low to keep temperatures above the 16°C discomfort level. Health problems come directly because of the cold and indirectly from condensation and fungal growth, report Sonja Hunt and Brenda Boardman, in the chapter 'Defining the Problem'. This means increased mortality and illness, with the latter estimated to cost £800-1000 million/yr extra for health care.

The working group defined 'affordable' in the title as needing no more than 10% of household income to be spent on heating. Currently the 30% poorest UK families average 9% and the other 30% average 4%. Within the 9% average, there are poor families who spend 20-30% of their income on heating. These numbers explain why VAT on fuel is not compensated by uniform uprating of benefits and pensions. Homes in the

north and windier parts require higher heating (for the same thermal standard), by 9% on the west Wales coast (Aberporth) and by 69% for Lerwick compared with Kew, the group calculates from local sun and wind data. Thermal conditions in the eight million homes of the fuel poor and the value achieved for their fuel expenditure are 'starkly different' from homes in comparable developed countries, writes Prof Markus.

The group has liaised with government and the proposed action strategy, though ambitious, does have a ring of realism. They recommend energy-rating of all 'at risk' households, to guide an upgrading programme over, say, 16 years, arguing this could well be justified in cost-benefit terms. Pending the upgrading, the Housing Benefit system would be modified to take into account energy properties, fuel costs and special heating needs. 'Heatability' should be part of the minimum fitness standard for dwellings. The working group recommended the NHER rating scheme, as it can already take local climate into account. They propose NHER grade 8 as the minimum upgrade target, though initial priority for capital improvement would go to the lowest rated homes (NHER <2). The costs and availability of qualified personnel for energy-rating is an issue, but a rudimentary survey to distinguish the lowest NHER rating can be done quickly.

The programme of thermal and heating system upgrades would cost £1250 million/yr, it is estimated, comparable to the uprating of benefits to compensate for the 17.5% VAT on fuel originally intended by the UK Government. But the upgrades would be targeted to need and result in energy saving rather than subsidy of continuing energy waste. The primary target should not be CO₂ savings, but improved welfare and living conditions, the group argues.

The study group drew much of its impetus from Heatwise Glasgow (Bill Sheldrick) and Energy Action Scotland (Ann Marno), who have already run pilot thermal upgrade projects. But Brenda Boardman from Oxford and Marcus Newborough from Cranfield as well as representatives of the utilities, of building engineers and of HOusing Associations have made significant contributions. The 160-page paperback study will be an influential reference book. Its arguments and data are being used for the new Private Members Bill on energy conservation going through Parliament. Maybe the Government's reversal over VAT on fuel and diminishing confidence that market forces can be relied on to cut energy waste will allow the study's arguments for a positive strategy to be taken seriously.

Max Wallis



A missed opportunity Propaganda or fact?

I should think that many members will be disappointed with the Institute's response to the Technology Foresight Programme's Energy and Transport sectors.

There appears to be a tame acceptance of the probability that we shall have to use imported technology for clean coal burning: 'Restraints upon the use of the private motor car would be extremely unpopular'. This is the sort of thing we have come to expect of the Government, but one would hope that the Institute of Energy would take a more positive long-term view.

One unmentioned environmental problem of the road transport sector is *congestion* of town centres and elsewhere with both moving and parked vehicles. The unrestrained private car and lorry represent an increasing menace however clean their exhausts may be, and a paper on future transport which does not mention trains or trams is odd, to say the least.

What about small short-range, self-drive electric taxis, operated by 'smart card' and parked at changing points by railway stations, shopping centres, theatres etc? What about the various energy-related proposals put forward by Lucas Aerospace? (From *Earth Matters* (Lucas) produced a plan with 150 alternative socially useful, environmentally desirable products as an alternative to job losses. These included a vehicle capable of running both on road and rails to provide the basis for an integrated public transport system and a heat pump using natural gas that would significantly reduce energy consumption.

'The plan was not taken up by the company but it is noteworthy that many of the products proposed are now being manufactured in Germany, Japan and other parts of world — and have resulted in significant job creation.'

What about wave power?

I feel the Institute has missed an opportunity to contribute some radical proposals to the debate on the future of energy and transport policy.

Eleanor Macnair (*Senior Fellow*)

THE December 1994 edition of *Energy World* (Number 224) contained several articles extolling the benefits of nuclear power to the world, and especially the UK.

Nuclear power does have an important role as part of a balanced energy policy for any country. And for this reason all supporters of a sound energy policy should endorse the use of a nuclear component in their country's electricity generating capacity. But the use of false arguments to put the case for nuclear power has a high risk: demonstration that one argument is wrong casts doubt on the entire case.

In his viewpoint article, John Bindon says of Scottish Nuclear and Nuclear Electric: 'both companies have clearly demonstrated their ability to compete in the commercial sector'. This is nonsense.

In the UK the law decrees that around 20% of all traded electricity must be nuclear generated. Any company can compete when it has a market for all its production protected by law!

In his article Malcolm Grimstone claims that nuclear power provides a contribution to sustainable development not afforded by the fossil fuels. His justification is that proven reserves of uranium will last about 50 years, but proven reserves for oil, gas and coal are 43, 59 and 240 years respectively. He escapes this problem by citing fast-breeder reactor technology, but only Japan is continuing significant work on its development. In addition, adoption of this technology would require massive amounts of plutonium to be transported around the world, a frightening prospect in view of the ever-present threat of terrorism.

The sustainability argument is false. Nobody can know the needs of the 21st century when coal reserves are finally exhausted, and nobody can know the technology that may then be available to meet those needs.

Mr Grimston also suggests that use of nuclear power avoids the use of fossil fuels better used as chemical feedstocks. Here he

has a point. Nuclear power only generates electricity and radioactive waste, whereas oil, gas and coal can make plastics, artificial fabrics, fertilisers, medicines and aviation fuels. 'Uranium has no other unique constructive uses' he states. I suspect that the population of Hiroshima would dispute this assertion.

He also states: 'the EU among other bodies is considering imposing carbon taxes, and perhaps acid rain taxes on such (fossil) fuels. Such measures would ensure that nuclear power was competing on a level playing field'. In which case nuclear power companies should not receive subsidies from the Fossil Fuel Levy, nor should they have a market for their products decreed by law.

An alternative level playing field could be provided by giving all electricity generators similar market protection and subsidies. Fossil fuel users could then use this money to pay the proposed carbon taxes. In such a scenario market protection for nuclear power would have to continue, in order for it to remain competitive.

Mr Grimston's assertions about the environmental benefits of nuclear power include the statement that emissions from BNFL's Sellafield plant have been reduced by a factor of 100 over the past twenty years. This merely demonstrates how appallingly bad the emissions used to be.

Few people will need reminding that Sellafield changed its name from Windscale in the hope that the public would forget it was responsible for one of the three worst nuclear pollution incidents in history. The article implies that effects of nuclear pollution are local, not global. But sheep farmers in Wales are still suffering the effects of contamination from Chernobyl.

He skates over the problem of waste disposal, saying that contamination is to be 'isolated from the environment'. This should fool nobody: nothing is removed from the environment while it remains on Earth.

It is in all our interests that the UK has a balanced energy policy that includes use of

The modern equivalent of the philosophers' stone?

AN all-party committee of MPs has questioned the wisdom of having spent some several hundred million pounds of taxpayers' money on renewable energy projects which do not produce sufficient electricity to justify the capital cost.

I see a similarity between the drive to develop renewable energy systems which could supply our electricity needs forever, and the search by the alchemists for the philosopher's stone, which could have made

them rich beyond their dreams of avarice. With our present knowledge we know that the alchemists' quest was futile. It is my contention that renewables could at best only supply a very small part of our power requirements and that they are unlikely ever to be economically viable as suppliers to the National Grid.

In my opinion the urgency attached to the development of renewables leads to a misuse of capital, and diverts attention from more

major considerations. How is the best use to be made of our dwindling fossil fuel reserves, until ultimately, like it or not, we will have to depend on nuclear power for most of our electricity supply?

The policy of closing mines and the 'dash for gas' gives us, for the present, electricity at a relatively low cost. I fear that in the long run a heavy price will be paid for this short term advantage.

G D Daniel (*Member*)



nuclear power, coal, oil, natural gas and economic renewables such as hydro. This policy would ensure security of supply: the effects of disruption of one energy source would be minimised by the existence of other sources. And it would be a buffer against rapid, severe price rises, such as the oils shocks of the 1970s.

The UK nuclear power industry has a record of telling lies to bolster its position. It always has had. Remember when the nuclear industry used to claim that one day electricity would be free, because nuclear power would be too cheap to meter?

The UK nuclear power industry has always

been closely associated with the nuclear weapons industry, making it immune from normal commercial considerations. But the cold war is over, and the nuclear industry needs friends, not enemies. Misrepresenting its own performance threatens its very existence: its enemies only need to prove that the industry is telling some untruths, and the entire case for nuclear power could be discredited.

Richard S Courtney
*Science and Technology Spokesman
British Association of Colliery Management*

What's it all for?

WHY do we bother? Having pursued a career in engineering and having always been advised to gain academic success and Institution membership, I now find that my employer, a regional electricity company, has decided that business cards will not carry information regarding either of the above.

Surely, we are all proud of our achievements and the degree of expertise we have gained. Our employers should also be proud of the calibre of their staff.

**Martyn C Ingham BSc(Hons) CEng
MInstE MCIBSE AMIMEchE**

ENERGY WORLD YEARBOOK 1995

Published annually on behalf of The Institute of Energy, the eleventh edition Energy World Yearbook is due for publication in March.

In addition to a comprehensive reference section and an extensive buyers' guide, this year's edition will also carry authoritative articles on subjects of vital importance to the energy industries, including European user inspectorates, the future of clean coal technologies, combined heat and power and the outlook for biomass.

Energy World Yearbook is free to Members of the Institute of Energy (except Student Members) and is available to those outside membership at a price of £50.00 (UK) and £55 (overseas) — prices include postage.

Available from:

**H Howland Associates, The Martins, East Street,
Harrietsham, Kent ME17 1HH.**

Tel/Fax: 01622 850100



Update from Sir John Fairclough

SINCE my presentation of the Unification proposal to the Council of Presidents in October, I have been heartened by the expressions of support so far received. With the agreement of the Presidents of Institutions and the Engineering Council I have set up the Transition Project Group (TPG).

This group comprises myself, as Chairman, Alan Rudge — past President of the Institution of Electrical Engineers, Stuart Mustow — past President of the Institution of Civil Engineers, Ken Burrage — member of the Engineering Council, and Rear Admiral Mike Valis — member of the Engineering Council. The TPG will take forward the implementation of the project once the Institutions and the Engineering Council have formally approved the proposal, which I hope will be in February 1995. It will report jointly to the Stage II Policy Group and the Engineering Council.

The TPG has met twice. We are concerned at this stage with the preparation of plans for the transition to the new arrangements. No executive decisions will be taken until we have formal approval of the proposal, which will take the form of signed Declarations of Intent by the Institutions and the Engineering Council. However, it is important that we start to address two issues if we are to have a smooth transition to the new arrangements next year. These are the recruitment of a Director General and changes to the Royal Charter of the Engineering Council. However, any decisions on either of these will only be taken when there is a clear mandate to implement the new arrangements.

We consider it very important to appoint a Director General as quickly as possible so that he or she can take a leading part in the implementation of the new arrangements. National advertising has produced 102 applications. To continue the necessary preliminary work, a small panel has been set up con-

sisting of myself as Chairman, Brian Kent — President of the Institution of Mechanical Engineers, Sir Geoffrey Allen — President of the Institute of Materials, Sir Frank Holroyd — member of the Engineering Council and Chairman of its Finance and General Purpose Committee, and Major General Malcolm Hutchinson — member of the Engineering Council and past President of the Institution of Electronics and Electrical Incorporated Engineers. We expect to create a short list and arrange interviews early in 1995, so that we will be in a position to make an appointment once we have a mandate to do so.

The Royal Charter for the Engineering Council must be changed to reflect the proposal. It is uncertain how long this will take as the approval of the Privy Council is required and the whole process could be lengthy. We are concerned to be sure that this activity will not prevent us making the transition next year. Because of this, preliminary work is being done to identify the changes necessary and to seek legal advice.

A number of Institutions have raised questions about the clause in the proposal stating that Institutions accept a target of 95% registration of their eligible membership within three years. From the questions that have been raised, it is evident that it will be necessary for the new body, early in its existence, to meet with each Institution and agree the number of members who are eligible for registration, and to agree a plan for registration, consistent with the particular circumstances of the Institution. It is important to note that the 95% target will only apply to those members who are registrable with the new body. It will be for the Institution to demonstrate good faith and commitment to this clause, rather than it being interpreted with unhelpful rigidity.

Sir John Fairclough

IEng awarded prestigious title

HAYLEY GLADSTONE, senior project manager with GPT Strategic Communications Systems, Coventry, has been awarded the title 1994 Young Woman Engineer of the Year. She was presented with her award by The Rt Hon Gillian Shephard MP, Secretary of State for Education, at a ceremony held in London.

The award, jointly sponsored by the IEEEIE and The Caroline Haslett Memorial Trust was inaugurated in 1978 to encourage young women to pursue a career in electronic and electrical engineering, leading to IEng level.

Chairman of the adjudicating panel, Roy Haley, commented on the exceptionally high

standard of entries for the 1994 title.

Ms Gladstone, 28, from Solihull, received a cheque for £750 and a silver rose bowl. She has been responsible for managing many major communications projects, including the modernisation of communications of the Beijing Metro.

Runner-up was Emma Croucher, 26, from Wiltshire. She is an outage planner with the National Grid Company in Bristol, and was winner of the Mary George Memorial Prize in 1991, an additional award given to the young entrant showing most promise as an incorporated engineer. This year's award went to Ann-Marie Wilkinson, aged 22.

The new approach

ENGINEERS must be equipped to lead industries which are increasingly operating worldwide in an intensely competitive environment, where communication is immediate and the customer is king. At the same time, they must be publicly responsible for the impact of their work on people and the environment.

The Engineering Council, taking into account the major developments in national education and training, launched in January far-reaching proposals for new standards of professional competence and commitment, that will take the UK engineering profession into the next century and place engineering at the forefront of modern professionalism.

The register of the Engineering Council exists to promote best practice for the public benefit. Registration will require engineers and technicians to demonstrate and maintain both the competence to perform their professional work to the necessary standards; and the commitment to maintain that competence, to work within professional codes, and to participate actively in the profession.

A major thrust will be to develop and assess competence in three parts: foundation learning, specialist learning and competence in employment against the background of clearly defined occupational standards. Flexible pathways and provision, when adequately specified, will be welcomed. Lifetime learning, supported by evidence of continued commitment of individual engineers to their professional updating and adherence to the Council's professional codes, will also be required.

These are some of the essential messages contained in a document *Competence and Commitment — the Engineering Council's proposals for a new system of engineering formation and registration* which the Council published in January.

The document takes into account the wide range of responses to an earlier discussion document *Review of Engineering Formation* published in 1993. It is in the form of a short policy statement supported by explanatory papers.

The document makes clear that the expected educational preparation for each of the three categories, CEng, IEng and EngTech, must be enhanced.

In addition it is proposed that UK candidates for the prestigious title of European Engineer (Eur Ing) will in future have to be fluent in a European language other than English, up to NVQ Level 3.

Copies of *Competence and Commitment* are available free from The Engineering Council, 10 Maltravers Street, London WC2R 3ER. Please send sae with an 80p stamp.



February 1995

CHP: powering the economy

Conference, 28 February - 2 March, Nottingham. Details from Franca Venetico, CHPA, tel: 0171 828 4077.

March 1995

Lighting design practice

One-day seminar, 1 March, London. Details from Seminars Secretary, Mid Career College, P O Box 20, Cambridge CB1 5DG. Tel: 01223 880016; fax: 01223 881604.

Elements of Regulation

One-day course, 7 March, London. Details from Continuing & Professional Education, Elements of Regulation Seminar, LSE, Houghton Street, London WC2A 2AE. Tel: 0171 955 7227, fax: 0171 955 7675.

Reviewing utility regulation: lessons for the future

Conference, 8 March, London. Details from CIPFA, 3 Robert Street, London WC2N 6BH. Tel: 0171 895 8823, fax: 0171

895 8825.

Forecasting the UK's Energy Requirements

8 March, University of Surrey. Details from BIEE, tel: 0181 997 3707; fax: 0181 566 7674.

Getting started in powder technology

Course, 14-17 March, Bradford. Details from Powder Research Ltd, 7 Westminster Gate, Harrogate, N Yorks HG3 1LU. Fax: 01423 873375.

Coal utilisation & fuel systems

20th international conference, 20-23 March, Clearwater, Florida, USA. Details from CSTA, 1156 Fifteenth Street, NW, Suite 525, Washington DC 20005. Tel: 202 296 1133; fax: 202 223 3504.

Energy saving — the people approach

Conference, 21 March, London, & 25 April, Warrington. Details from The School of Business & Industrial Management, Caxton House, Wellesley Road, Ashford, Kent TN24 8ET. Tel:

01233 622101; fax: 01233 611771.

Risk assessment & loss control

Seminar, 21 March, West Midlands. Details from Maria Palmer, MEB International, Midlands Electricity plc, Mucklow Hill, Halesowen, West Midlands B62 8BP. Tel: 0121 423 2345; fax: 0121 625 1803.

Of Molecules, Major Hazards and Money

7th Vernon Clancy Memorial Lecture, 22 March, London. Details from Vice-Chancellor's Office, City University, Northampton Square, London EC1V 0HB. Tel: 0171 477 8002.

PowTech '95

Trade fair, 21-23 March, Nurnberg, Germany. Details from Nurnberg Messe GmbH, Messezentrum, D-90471 Nurnberg, Germany. Tel: 09 11 86 06 0; fax: 09 11 86 06 2 28.

Looking over the fence

Conference, 23 March, London. Details from Caroline Little, The Institute of Petroleum, 61 New

Cavendish Street, London W1M 8AR.

Institute of Physics annual congress

27-30 March, Telford. Details from IoP, 47 Belgrave Square, London SW1X 8QX. Tel: 0171 235 6111; fax: 0171 259 6002.

Vision 2020: foreseeing energy needs for Europe

Conference, 28-30 March, Amsterdam. Details from Mrs Kit Stones, The Conference Team, 17 Spring Road, Kempston, Bedford MK42 8LS. Tel/fax: 01234 343384.

Central & Eastern European Power Industry Forum

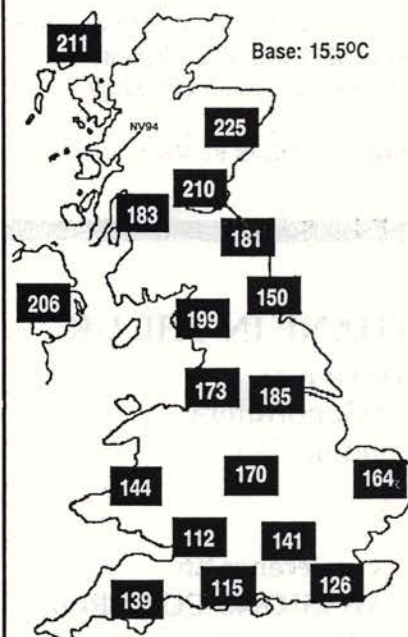
Conference & exhibition, 29-30 March, Warsaw, Poland. Details from PennWell Conferences & Exhibitions, P O Box 9402, 3506 GK Utrecht, The Netherlands. Tel: +31 30 650963; fax: +31 30 650928.

Instrumentation Update

Colloquium, 30 March, S'hampton. Details tel: 01703 593545.

DEGREE DAYS: NOVEMBER 1994

Source: Degree days direct



These regional figures, calculated from daily outside air temperatures, provide an index of demand for space heating over the month and thus enable excessive consumption to be detected.

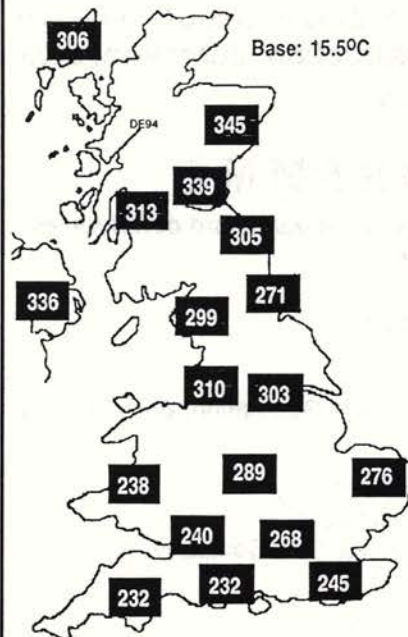
A well-controlled heating system should manifest a straight line relationship between monthly fuel used and the local degree-day value; any significant deviation from this 'target characteristic' is likely to signal the onset of avoidable waste (such as a stopped timeswitch or an open isolating valve).

Readers can get more information on the use of degree days from Vilnis Vesma, 17 Church Street, Newent, Glos GL18 1PU (0531-821350)

© Vilnis Vesma, 1994. Because different observing stations are used, the figures given here will not necessarily agree exactly with those from other information providers.

DEGREE DAYS: DECEMBER 1994

Source: Degree days direct



These regional figures, calculated from daily outside air temperatures, provide an index of demand for space heating over the month and thus enable excessive consumption to be detected.

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© Vilnis Vesma, 1995. Because different observing stations are used, the figures given here will not necessarily agree exactly with those from other information providers.

GAS TURBINE POWER GENERATION

Thursday 4 May 1995

**Commercial, Economic
and Operational
Challenges**

The Conference Forum,
The Sedgwick Centre, London E1

Why you should attend

The programme has been carefully structured to draw upon a range of UK and international experience to consider the business aspects of Gas Turbine Power Generation. The focus will be on commercial, economic and operational experience. Particular emphasis will be placed on lessons learnt, best practice, health and safety and environmental requirements with a clear review of cost implications.

Who will benefit?

This conference will be of direct relevance to those involved in power station: development, design, construction, operation, contracts and financing.

THE PROGRAMME

The conference will begin at 0.945 and conclude at approximately 16.30hrs.

Conference Chairman

Nick Woollacott
Managing Director, Power Generation, British Gas plc

Opening Address

David Jefferies CBE FEng
President of The Institute of Energy
& Chairman, The National Grid Company plc

Keynote Address

Roger Jump
Executive Director/General Manager, PowerGen plc

1 COMMERCIAL & ECONOMIC

Three different perspectives on the development period from project inception through to financial closure.

The Developer

David Lewis
Vice-President, Business Operations
ENRON Europe Ltd

The Supplier

ABB (speaker to be announced)

The Operator

Bill Watson, Managing Director (Generation)
Eastern Group plc

2 CONSTRUCTION & COMMISSIONING

Examining the period from award of construction contract to plant operation. Particular value will be attached to lessons learnt that would influence future development philosophy.

The Owner/Operator

ESBI (speaker to be announced)

3 OPERATION & MAINTENANCE

Experience from initial commercial operation through to full-scale production.

MISSION (speaker to be announced)

4 ENVIRONMENTAL

Health, safety and environment; a review of issues affecting modern power plant with particular emphasis on cost implications.

Prem Hahi, Head of Environmental Department
Mott Ewbank Preece

5 FUTURE DEVELOPMENTS

Present day turbines-based power plants are capable of thermal efficiencies of 52% with over 58% in prospect. How much further can the technology improve?

European Gas Turbines (name of speaker to be announced).

September 1995

COAL BED METHANE IN THE UK

Utilisation & Competitiveness —
The Real Commercial Opportunities
The Royal Society, London SW1

3-5 December 1995

Second International Conference on
COMBUSTION & EMISSIONS CONTROL
Commonwealth Institute, London W8

THE INSTITUTE OF ENERGY SOUTH WALES AND WEST OF ENGLAND BRANCH

The 22nd IDRIS JONES MEMORIAL LECTURE

Sponsored by Nuclear Electric plc

The Role of Nuclear Power in a Changing World

by J G Collier FRS FEng

Chairman, Nuclear Electric plc

on Friday 19th May, 1995 at 11.15 am

(coffee and reception at 10.30 am) at

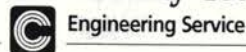
**THE CONFERENCE CENTRE, NUCLEAR ELECTRIC PLC,
BARNETT WAY, BARNWOOD, GLOUCESTER**

to be followed by THE BRANCH ANNUAL LUNCHEON
at 12.15 pm (aperitifs) for 12.45 pm

Admission to the lecture is free but those wishing to attend should apply for tickets. Tickets for the luncheon should also be applied for, these will cost £8.00 per head, inclusive of aperitifs and wine with the meal.

*Tickets will be sent out in early April. Ticket applications to:
D H Mustoe, 20 Parkcourt Road, Bridgend, Mid Glam CF31 4BW*

Cheshire County Council



Oil Recycling Franchise

A franchise contract is due to be awarded for the recovery of oil from the following Household Waste and Recycling Centres:-

Clayhill Centre	Clayhill Industrial Estate, Neston
Rosfield Road Centre	Rossmore Industrial Estate, Ellesmere Port
Chester Centre	Bumpers Lane, Chester
Picow Farm Centre	Picow Farm Road, Runcorn
Johnson's Lane Centre	Johnson's Lane, Widnes
Gatewarth Centre	Gatewarth Farm, Warrington
Woolston Centre	New Cut Lane, Woolston
Bollington Centre	Albert Road, Bollington
Poynton Centre	Anson Road, Poynton
Knutsford Centre	Shaw Heath, Knutsford
Wilmslow Centre	Newgate Lane, Wilmslow
Pyms Lane Centre	Pyms Lane, Crewe
Middlewich Centre	Croxton Lane, Middlewich
Alsager Centre	Hassall Road, Alsager
Arclid Centre	Davenport Lane, Arclid
Congleton Centre	Barn Road, Congleton

Anyone wishing to be considered should apply in writing to Miss L Caiger, Recycling Officer, Cheshire County Council, Waste Disposal Authority, Backford Hall, Chester, Cheshire CH1 6EA, by no later than 10am on Monday 30 January 1995.

Committed to Equality of Opportunity

British Council International Seminar
(Seminar number 9530)

Rural electrification with renewable energy technologies: Policy options and strategies

21 to 26 May 1995

Southampton

Directed by Anthony Derrick

The seminar will review the options for accelerating the introduction of renewable energy technologies into the electrification and development of rural areas in developing countries.

The topics to be covered during the seminar include:

- performance, cost and economics of renewable energy technologies
- applications in rural electrification, including household energy, water supply, rural industries and communications
- barriers to introduction of renewable energy technologies - technical, economic, institutional
- options for introducing renewable energy technologies - financing schemes, implementing agencies

The programme will be of particular interest to rural development project managers, professionals in development banks, financial institutions in developing countries and rural electrification specialists.

Fee: £1,190 (includes seminar programme, accommodation and meals)

For further information contact: Marketing Manager, International Seminars Department, The British Council, 10 Spring Gardens,

London SW1A 2BN

Telephone: +44(0)71

389 4264 / 4252 / 4226

Fax: +44(0)71 389 4154

Telex: 8952201

BRICON G

(Please quote the seminar number in all correspondence.)

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