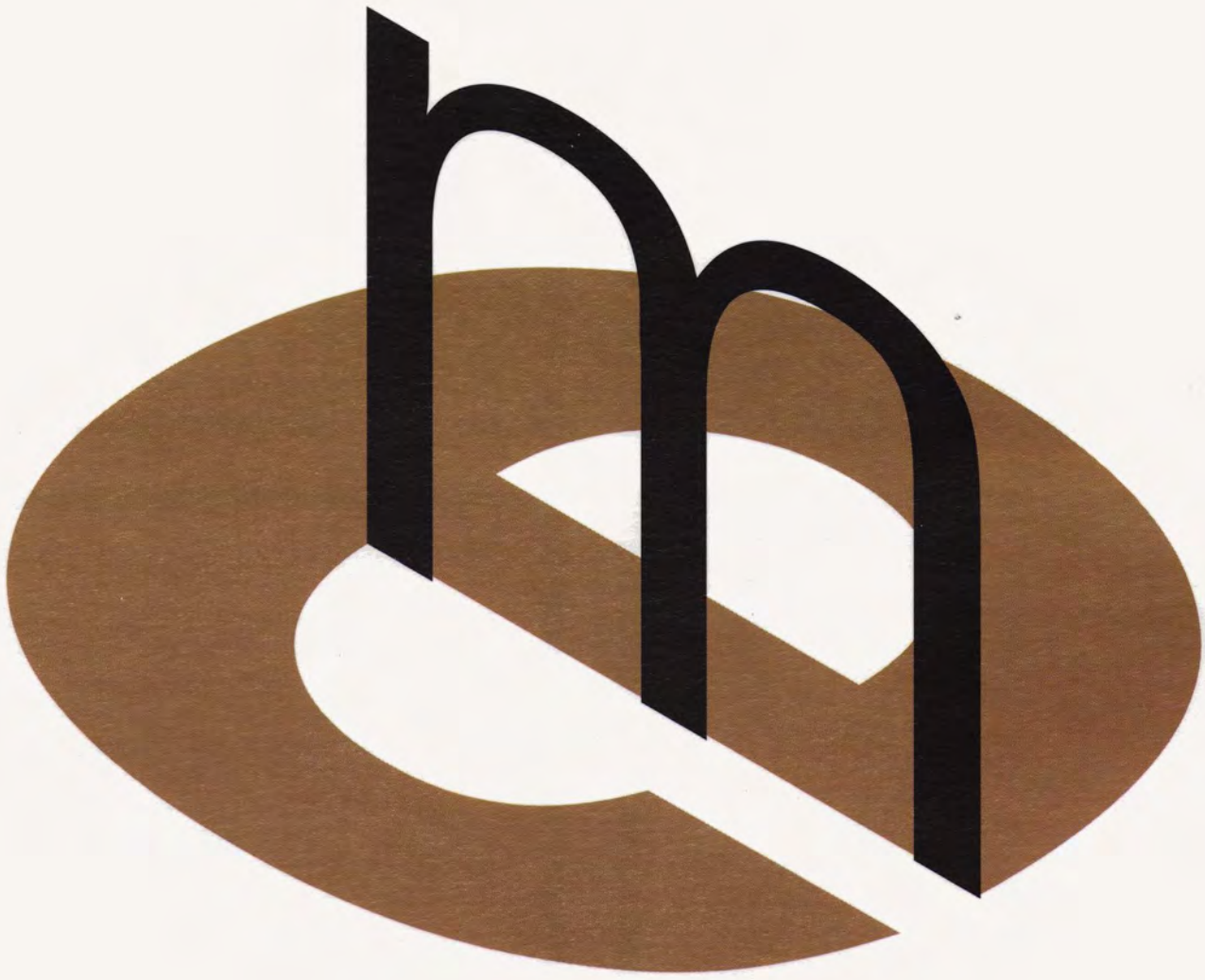
THE MAGAZINE OF THE INSTITUTE OF ENERGY

energy world

the institute of energy

No.276 February 2000

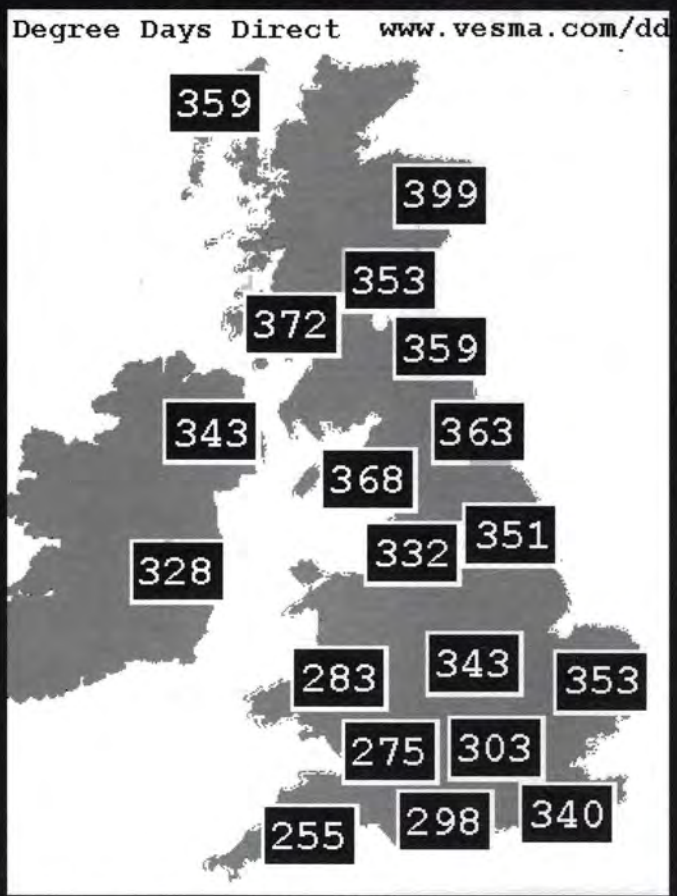


Marketing renewables

Shadowing the solar city

Energy storage

Degree Day Figures December 1999



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THE MAGAZINE OF THE INSTITUTE OF ENERGY

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COVER

Become the Energy Manager of the Year - the Institute of Energy is the accrediting body of a new award to recognise energy professionals who have made an outstanding contribution to improving energy management within their company or organisation. The first "eibi Energy Manager of the Year" Award will be presented at NEMEX 2000 in three categories: large and small businesses, and the public sector. Judging will be by a panel of energy professionals, including the President of the Institute; the closing date for entries is 28 April.
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Energising the efficiency industry

Here are two questions for you. The background to them is: the Government has over recent years made several serious environmental commitments, setting various targets for the nation. To implement these will necessitate a quantum change in the levels of activity undertaken by all sectors of the energy efficiency industry.

So the questions are: is this industry capable of responding in full to such challenges? And, if so, what are the external conditions which will be needed to ensure these challenges are met?

Broadly, there are three business categories to consider: the manufacturing sector, the distribution and installation sector. And between these two - the main sector interfacing with consumers - advice agencies, technical consultancies and retailers. Each should be considered in turn.

Andrew Warren, Director, Association for the Conservation of Energy

It is manufacturing which will need to expand first. Already senior civil servants are forecasting 50% compound growth for several years for key sectors like cavity wall insulation, if targets are to be met. There is at present under-capacity, often severe, in every sector. But even were production levels to hit maximum capacity, this will not satisfy these perceived levels of demand.

To do so from UK based factories will require unprecedented capital investment in new plant and machinery. There seems little doubt such investment will be forthcoming - provided the criteria set out below are met.

Increases in capital expenditure from the manufacturing sector are unlikely to require anything like the accompanying levels of training investment which will be vital for the other two sectors. Both are intrinsically extremely labour intensive.

Politically attractive as this sounds, such substantial increases in employment start from a problematic base. Quite apart from numerical expansion, we already have a high age profile for those with appropriate installation skills. Traditional apprenticeships, whether in the construction or heating industries, have diminished drastically over the past 20 years. This has been exacerbated in the energy sector by the privatisation of the large state-run monopolies, previously responsible for much of the relevant training.

This will be a substantial task. But not impossible. The construction industry itself is a mature one. Other parts are unlikely to enjoy such exponential growth as the energy saving side. Much of the relevant work can be undertaken after relatively swift re-training, by those with established construction industry trades, particularly if a wide range of fabric measures is promoted simultaneously. It is not possible to be so sanguine about the HVAC sector: hence the long-term importance of initiatives like the Gas Industry National Training Organisation.

What then about what in computer-speak is called the "interface" sector, but which we mortals usually call "advice"? This can grow by strengthening the existing good quality network of specialist trainers. Who will in turn train others, creating a cascading effect. That will provide personnel for advice agencies and energy efficiency consultants. Far more numerous will be those non-energy specialists, who will include energy advice as merely one component skill to enable them to carry out their jobs. As environmental advisors to companies. Or shop assistants. Or health or social workers guiding householders.

Right. Now we have reached the second question. What will trigger such a quantum leap, going far beyond incremental changes? It is obviously fallacious to believe this can happen without unprecedented external stimuli upon the market. Such stimuli can only come from Government.

What will convince the private sector to respond? The answer is a judicious mixture of regulatory changes, financial incentives, and tax alterations. These are the traditional carrots and sticks which can stimulate the energy efficiency "donkey". But beyond that lie the tambourines. These must be designed to make sufficient noise to attract, then hold, attention.

It will certainly need several overt policy changes. Each must boost the market potential for energy efficiency services. Indeed it would even be prudent to make plans for initiatives which - taken together - actually exceed stated targets. This would help militate against the risk of any specific part of the programme failing to achieve its objectives, and thereby diminishing the campaign's overall effectiveness.

This spring the Government will publish its long-awaited strategy for tackling climate change, for meeting those commitments. Those with uncomfortably long memories may recall that back in 1993 the last Prime Minister launched a Command Paper, ostensibly with the same objective. That so little of what was then promised actually occurred - remember the "Homes 2000" package, due to upgrade most of UK housing? - might explain the private sector's current scepticism, which present Ministers find so frustrating.

Only when Government has put in place such a programme will the major players in the energy efficiency industry move. Or for that matter, significant new entrants emerge. Only then will they become sufficiently convinced of the long-term nature of the sea-change in strategic policy to commit themselves to undertake the anticipatory, unprecedented investment levels in response. The current stand-off must not continue too long.

Methane may be key to meeting emissions targets

Incorporating methane (CH_4) in the US strategy for reducing greenhouse gas emissions greatly lowers the costs of meeting overall targets for emissions reductions, suggests a report in *Science* magazine, perhaps by as much as 40%. Until recently, options for reducing carbon dioxide (CO_2) emissions were the only strategies considered.

The potential for savings exists because a significant quantity of methane emissions can be reduced with options that have no reduction costs or very low costs, says the report. These options generally are based on recovering methane that would otherwise be emitted, and subsequently selling it or using it to displace other sources of energy. Low-cost options are available in the US for reducing methane emissions from coal mining, oil and gas production and distribution, landfill, and manure management systems.

The dramatic effect of methane in emissions reductions is due to its potency in absorbing infrared radiation combined with its relatively short life in the atmosphere. Methane's potency gives it a relatively high global warming potential, while its atmospheric lifetime of about ten years means that methane concentrations will respond quickly to abatement measures, producing an immediate benefit in terms of slowing the rate of climate change. However, as targeted reduction levels increase, low-cost methane reduction options saturate quickly. Thus, the authors conclude, reducing carbon dioxide emissions remains the primary means of achieving significant long-term mitigation of climate change.

US consumers demand wind energy

National Power has won its first international deal to build a wind farm specifically to meet customers' orders for green electricity. The 10 MW project will supply householders in Pennsylvania, US, who have chosen to have their power generated from environmentally friendly sources of energy.

Around 75,000 people have signed up with GreenMountain.com, a leading US domestic retailer of electricity from cleaner and renewable generation sources. To help meet this demand, National Power and GreenMountain have joined forces to build the largest wind farm in Pennsylvania near Garrett in Somerset County.

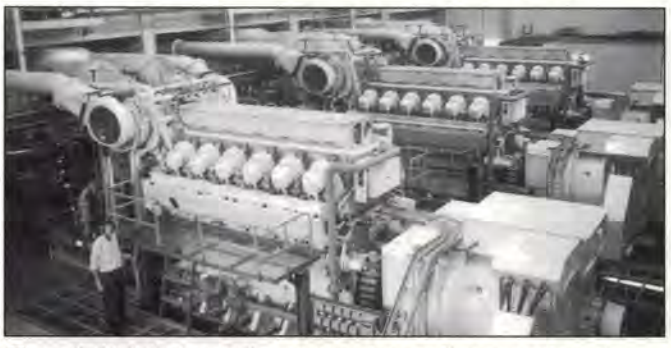
The $10 million project will have eight, 60 m high wind turbines. The wind farm is scheduled to be operational in May.

Meanwhile, Enron Wind Corporation has commissioned the Green Power I wind power facility, near Palm Springs, California. The project, built solely to supply emerging green power markets in the US, is the first major renewable energy power plant to be built since California opened its markets to competition in 1998. The 22 turbines at the 16.5 MW facility began generating power last June, producing enough clean electricity to supply the annual residential needs of 6,000 typical US households.

Guatemalan cement producer opts for CHP

Central America's largest cement works, Cementos Progreso in Guatemala, has reduced its energy costs by 35% by building its own energy station incorporating three heavy fuel MaK M453 engines from Caterpillar.

Located 65 km from Guatemala City, the plant's production process requires electricity to operate its rotating kilns and heat, from heavy fuel oil, to fire the kilns. A thermal oil-heated steam generator produces approximately 750 kg of saturated steam per hour to supply additional heat needed for a limestone operation, adjacent to the plant.



Three 4.4 MW Caterpillar engines power the cement works

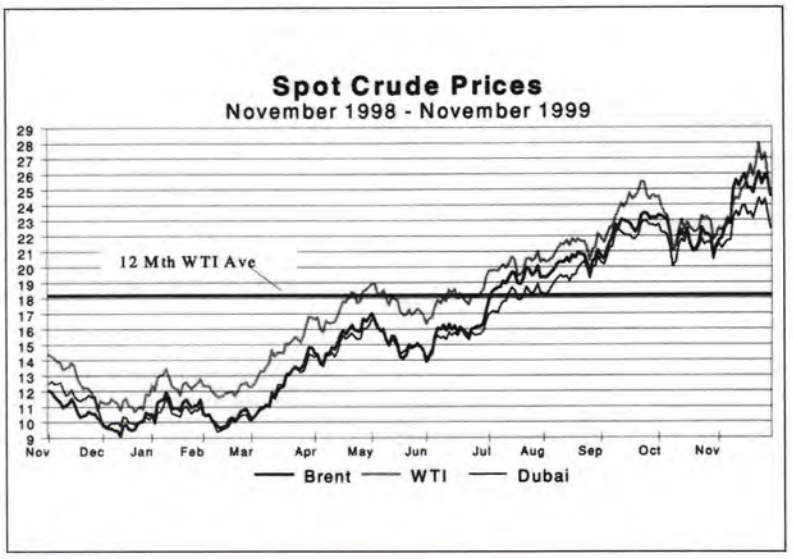
The company carried out an extensive study to measure the costs and impact of building an on-site power station as an alternative to purchasing power from the local utility grid. Due to the complex start-up and shut down process of the cement works, and because the process heat requirement is critical to the operation, power and heat reliability were identified as the key issues in the decision.

Officials elected to build a power house based around the three 12-cylinder Vee-configured MaK M453 engines, each rated to provide up to 4.4 MW of continuous power. Since heavy fuel was used to heat the burners, only the existing fuel supply system needed to be modified for the new generator sets.

The MaK engines were particularly appealing to the designers, say Caterpillar, due to their proven performance with heavy fuel and the 4:1 ratio of load to heat output, necessary for the process heating of the cement production. With the installation of comparatively large exhaust gas boilers, the entire heat requirement of the cement works can now be supplied by 'waste' energy.

Oil price recovery – a year on from reports of world oil prices dipping below $10 a barrel, the price of crude had climbed to above $25 a barrel by the end of 1999, depending on its type. The graph (from the IEA's Monthly Oil Report) shows the unsteady but relentless climb in spot prices during the year, together with the 12 monthly average.

Last March's issue of Energy World reported that prices hit a 50 year low in December 1998 and had remained around $10-12 a barrel since. The recovery since then has been dramatic. The IEA now characterises the market as 'thirsty' with demand outstripping supply, resulting in falling stocks and rising prices. Demand has risen to meet strong economic growth in North America and the recovering economies of Asia.



Will the US achieve its Kyoto goals?

Conflicting views as to the chances of the US meeting its Kyoto Protocol commitments have been revealed in two new reports.

A study by the American Council for an Energy-Efficient Economy (ACEEE) found that a combination of ten policies to improve US energy efficiency and encourage the use of renewable energy could achieve the US target of reducing greenhouse gas emissions to 7% below 1990 levels by roughly 2010. Rather than costing money, the study suggests that achieving the Kyoto targets would save the United States $200 billion by 2010.

Meanwhile, the ACEEE report stands in contrast to the recently released *Annual Energy Outlook 2000*, produced by the US Department of Energy's Energy Information Administration (EIA).

The new Outlook predicts that economic growth will spur an increase in US energy-related carbon emissions to nearly 33% above 1990 levels by 2010. However, a renewable energy requirement and energy efficiency standards for appliances could cut the increase in carbon emissions by about 2%, according to the EIA report. The EIA also acknowledges that a rapid adoption of energy efficiency technologies could cut the increase by an additional 5% - still leaving an increase of 26% over 1990 carbon emission levels, far above the Kyoto target.

Storing gas - while large gas utilities often have gas storage facilities in the form of caverns or aquifers to help cope with variations in gas consumption and bottlenecks in gas delivery, municipal utilities usually have to look for alternative storage possibilities, including having natural gas pipe arrays, to meet short-term peak consumption, according to the Germany-based Europipe. These facilities not only help optimise gas supplies but also enable gas purchases to be decoupled from gas consumption.

Natural gas pipe arrays are generally made using longitudinally welded expanded large-diameter steel pipes. Storage capacities range from 20,000 m^3 to 370,000 m^3 at operating pressures of between 74 and 100 bar.

Expansion of the steel line pipes produces optimum straightness and roundness with a uniform diameter, which practically eliminates welding edge offset during on-site welding, says Europipe. Pipe lengths of up to 18.3 m reduce the number of girth welds required, and all pipes can be supplied with a works-applied epoxy resin or polypropylene coatings.

Fourth Magnox station to close in 2002

Bradwell nuclear power station in Essex is to cease electricity generation in March 2002, the year of its 40th birthday, says owner and operator British Nuclear Fuels (BNFL). The 245 MW capacity Bradwell will become the fourth of Britain's ageing Magnox reactor be closed down and put into safe storage ahead of full decommissioning.

The remaining five Magnox reactors: Dungeness A, Hinkley Point A, Oldbury, Sizewell A and Wylfa, were commissioned between 1965 and 1971.

The Bradwell decision follows a study which concluded that the multi-million pound financial injection needed to keep the station operating to 2012 cannot be justified, says BNFL. "We have always said that it would be an economic decision which ultimately led to Bradwell's closure," said station manager Peter Wright. "That time has, sadly, been identified in just over two years' time."

Both reactors at Bradwell are currently shut down for inspection and repair work. Subject to satisfactory completion of this work at acceptable cost, and with the approval of the NII, BNFL plans to return the plant to service very soon.


The Bradwell Magnox site

Mr Wright, who became manager of the Magnox station in 1996, said that the site had been working hard to show that there were no technical reasons to prevent applying to its regulator, the Nuclear Installations Inspectorate (NII), for a licence for a further 10 years. "We are confident we could achieve that – but with the current electricity price we have been unable to satisfy ourselves that the return over that further 10-year period would justify the multi-million pound investment needed," he added.

Mr Wright said that the 350 staff working at the station had received the news with obvious disappointment. Staffing numbers will remain broadly the same until 2002. After that, the first stage of decommissioning will take place – initially a two to three year programme to defuel both reactors, a process which removes 99.9% of the radioactivity. The fuel will be transported in the normal way to Sellafield for reprocessing.

"Based on the experience at our other decommissioning sites, it is likely that 200 to 250 staff will be required for the defuelling stage," said Mr Wright. "That figure will gradually decrease until we move into a 'care and maintenance' phase when only a handful of employees will be needed."

BNFL are not strangers to the decommissioning process. The company has three other Magnox stations in the UK presently in that phase – Berkeley in Gloucestershire, Trawsfynydd in Gwynedd and Hunterston A in Ayreshire. The company is also involved in major decommissioning projects in North America.

- The Japanese Kansai Electric Power Company has rejected a consignment of mixed oxide (MOX) fuel supplied from a pilot MOX manufacturing plant operated by BNFL at Sellafield. Kansai was unhappy with the quality of records of its production. The setback comes as BNFL is awaiting Government approval to start production at its full-scale MOX plant at Sellafield.

Degree days for Euro energy managers

Energy managers outside the UK can now take advantage of the free monthly degree day data published on the Internet by Vilnis Vesma's Degree Days Direct (www.vesma.com/ddd). The service has started to publish figures for a selection of European cities.

The new international data, which takes the place of the familiar UK regional map, covers cooling as well as heating, and is expected to be of interest to UK-based multinational companies as well as overseas users in the countries concerned. Visitors to the site can however still find current UK data via a link on the redesigned page.

Proprietor Vilnis Vesma, an energy consultant, started Degree Days Direct in 1992 sending monthly hard-copy reports by conventional mail to a small list of paying subscribers. He added direct dial-up database soon after in order to handle weekly reporting. Web-based free publication started in 1996, with a closed subscription service following in 1997. Now, with the bulk of transactions being effected over the Internet, he describes the enterprise as having been "suddenly and surprisingly propelled into the global arena".

Go carbon neutral with Future Forests

Environmental task force Future Forests has launched what it calls "the world's first website offering tree purchases on-line to offset carbon dioxide emissions". The site can be accessed at *www.futureforests.com.*

The site demonstrates how the day-to-day activities of both business and individuals impact on carbon dioxide emission levels and enables them to take action, at the touch of a button, by utilising the site's e-commerce facility.

Visitors complete an on-line assessment, using readily available information such as utility bills and annual car mileage, from which a total figure for carbon dioxide emissions can be calculated. The assessment takes minutes to complete and within seconds automatically calculates the number of trees required to offset the carbon dioxide emissions. Future Forests currently offers a choice of 20 designated public access forests across the UK and Chiappas in Mexico, in which the trees can be planted. Tree purchasers receive a certificate and map of their chosen location by return on-line. Future Forests will announce shortly tree-planting programmes in forests around the world.

Dan Morrell, founder of Future Forests, commented: "By launching *www.futureforests.com*, Future Forests is using a global medium to respond to a global problem, with a product that is tangible and local – trees in your neighbourhood. Whilst planting trees is no panacea to the issue of carbon dioxide emissions, the site provides a straightforward and practical means by which everyone and every business can take positive action a the touch of a button."

Fifteen thousand members of the public, as well as leading businesses such as BT, Avis Europe, Mazda UK, EMI and Imagination, and events such as Glastonbury Festival and The Motor Show are already 'carbon neutral' with Future Forests, says the company, which has to date planted over 100,000 trees in 39 UK forests.

London and Eastern join forces to run power networks

Two British regional electricity companies are to join forces to run their power networks. TXU subsidiary Eastern Electricity and London Electricity are to establish a new stand-alone joint venture company which will be owned equally and will bring together the staff who maintain and operate both electricity distribution networks in the two areas.

The joint venture will improve efficiencies through economies of scale and sharing best working practices, leading to improved services to customers, says London and TXU, adding that more than five million electricity customers in London and the Eastern counties will benefit from the ground-breaking decision.

The move will also enable both businesses to achieve the price reductions set out in Ofgem's distribution price review. The joint venture will have, as a long-term aim, the management of infrastructure assets on behalf of other utilities and private networks in the UK.

The physical assets, including overhead lines, underground cables and buildings, together with operating licences and the income from supply companies, will still be owned by the two parent companies.

The announcement does not affect customer choice in the competitive market, says TXU and London. The two parent companies' electricity and gas retail arms remain separate and will continue to compete for business.

The two parent companies expect the creation of the joint venture to produce significant cost savings through the consolidation of operations. This will be achieved through improved procurement, use of single IT systems and processes, reduced property costs and other economies of scale. It is anticipated that, by the start of the joint venture, staff numbers across the combined workforce will be reduced by 400. Over the following 18 months, at least a similar number of job reductions are envisaged.

Retailers could cut energy costs by £50 million

Britain's retailers, banks and building societies could slice £50 million off their energy costs – and benefit the environment – by using power more efficiently. The potential savings represent some 10% of the £500 million currently spent on power by retailers, who account for around 5% of national energy consumption.

The savings - equivalent to the output of a major power station - have been identified by the Retail Energy Efficiency Club, established in 1998 by energy specialist EA Technology, with members including Asda, Tesco, Safeway, Sainsburys, Waitrose, Comet and Superdrug.

Funded by its members, the club enables them to share resources and knowledge when evaluating and adopting a wide range of energy-saving measures. Members vote on which measures they wish to consider and EA Technology provides the technical facilities to assess accurately the savings which can be achieved.

"We have demonstrated that the average retail premises can waste around 10% of the energy it uses, which may be saved through efficiency initiatives applied to lighting, air conditioning, refrigeration and heating. In many cases, significant savings can be made by implementing relatively simple measures," explained EA Technology director John Walker.

Government consults on support for efficiency

Consultation on how businesses can best use the £150 million to be made available by the Government, under its proposed Climate Change Levy, to help improve their energy efficiency ends on 4 February.

Views were sought from businesses, environmental groups and other interested parties about a proposed new business energy efficiency programme and the qualification criteria for an Enhanced Capital Allowances (ECAs) tax relief scheme for energy saving investments.

The consultation document proposes five energy efficient technology categories that might qualify for the ECAs from the start: CHP, boiler systems, motors, variable speed drives and lighting systems. Other categories could follow later. Under the proposed ECAs scheme, businesses who invest in energy saving technologies will be able set the entire cost of the investment against their corporation or income tax bills in the year of purchase.

The support for investment in energy efficiency measures was trebled to £150 million in last November's pre-budget speech by Chancellor Gordon Brown (see *Energy World* January 2000). Subsequent consultation involved three ministers: Financial Secretary to the Treasury, Stephen Timms; DETR Environment Minster Michael Meacher; and the DTI Minister for Energy and Competitiveness in Europe, Helen Liddell.

Speaking at the UK Steel Annual Forum, Michael Meacher said: "It is essential that our economy gears up to meet the Kyoto targets and beyond. The £150 million being made available in 2001-02 will help businesses help themselves by saving energy and costs. It marks a major drive for low carbon technology in the new millennium".

Following evaluation of the responses, it is anticipated that the Chancellor will make further announcements on the proposed Levy in the 2000 Budget. It is planned to introduce both the enhanced capital allowances and the energy efficiency money alongside the Climate Change Levy in April 2001.

Biofuels lobby seeks lower taxes

A fundamentally sound means of reducing pollution from road traffic – the wider use of biofuels - has been blocked for years by bad science, according to the British Association for Biofuels and Oils (BABFO). Poorly conceived experiments and inaccurate interpretation of resulting data have nevertheless been made the basis of past Government policy on liquid biofuels, says the Association..

Now, basic errors in the original work have been exposed in a report by independent international research institute, ECOTEC, and released by BABFO. ECOTEC concludes that "it would be logical and environmentally sensible to apply the same rate of tax to biodiesel as is currently applied to LPG and compressed natural gas (CNG), since biodiesel offers equivalent, if not better, environmental benefits as a road fuel".

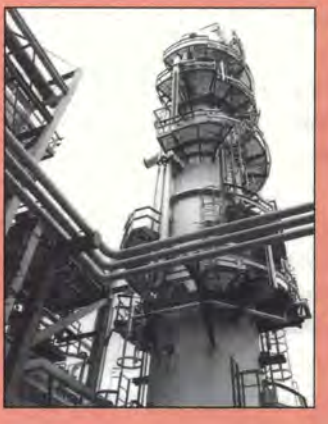
Biodiesel is a transport fuel for the future - renewable, sustainable, biodegradable, recycles carbon and cuts emissions, says BABFO.
As Peter Clery, Chairman of the Association puts it: "The duff gen on biodiesel can now be consigned to the waste bin. The way is now clear for a more logical approach to fiscal incentives for environmentally sound road fuel policies. Bio diesel and Bio ethanol should be taxed on their energy content on at least the same basis as fossil derived road gas fuel."

Biodiesel - fuel produced from plants - used for road fuel is currently taxed at the same rate as conventional diesel. But its slightly lower energy density means that it incurs the highest rate of taxation per GJ of energy content – while unleaded petrol and low sulphur diesel are taxed at lower rates, and duties on LPG and CNG equate to just one-fifth of that paid on conventional transport fuels, says the ECOTEC report.

Conoco Limited has unveiled a ten-year, £700 million investment programme for its Humber refinery, including £90 million on new units to produce clean fuels and £250 million on an advanced CHP plant to meet the refinery's future energy needs.

Making her first visit to an oil refinery since taking up her post earlier last year, Energy Minister Helen Liddell congratulated Conoco on the clean fuels investment, which will produce ultra low sulphur petrol and diesel: "This investment will reinforce Humber's position as one of Europe's premier refineries and enhance its ability to supply cleaner road fuels to the UK market, in line with the Government's commitment to improve air quality".

Mrs Liddell also said that Government tax incentives had resulted in ultra-low sulphur diesel accounting for 96% of UK road diesel sales, "However, many of the components for UK ultra-low sulphur diesel are presently imported so I am heartened to see that this investment at Humber refinery will allow a more economic and efficient means of producing this fuel here in the UK".



Renewable energy – does it

How is the market for renewable energy in the UK to grow towards the Government target of 10% of total electricity by 2010? Will it be by a new subsidy to follow NFFO, or are market forces powerful enough to drive growth – and how effective with the Climate Change Levy be? Here, the Renewable Energy Company's Dale Vince argues that real growth will require both market support and a customer pressure.

Renewable energy currently provides around 2% of the UK's power. As part of a response to climate change and our Kyoto commitments the government has set a target of 10% by 2010 and the means of achieving this target is currently the subject of a protracted review - delayed no doubt by the changes and reviews in the wider electricity market - the Utilities Bill and new electricity trading arrangements.

The main growth in renewable energy capacity in the last ten years has come from the Government's Non Fossil Fuel Obligation (NFFO) programme - in round numbers half the UK's 2% has come about through NFFO in the last ten years. Compared to this, to reach 10% by 2010 will require a ten fold increase in new capacity in the next ten years. It might seem reasonable to assume that an increase in capacity of this magnitude could only come from some form of government support mechanism, if not a small miracle.

The green market

However there are other factors at work. Firstly - the UK has a market place for green electricity. Consumers in the UK have the power to choose not only their supplier but, since 1996, the source of that supply and hence the environmental impact of their energy use. This market was founded by a small independent supplier, The Renewable Energy Co, frustrated by the poor prices on offer from host electricity companies. At that time the privatised electricity companies saw no prospects for green electricity in the market place and were monopoly purchasers of embedded generation.

Since then the market for renewable energy has grown considerably, as witnessed by the turnover of the market founder and leader from £13,000 in 1996 to over £50 million this year. And today every privatised electricity company either has a green offering available to customers or is planning to have one. They have all recognised a commercial imperative to have a green tariff, although this is not the same as actively supporting new renewable energy development. Most schemes are token gestures, 'environmental fig leaves' or 'me too' tariffs requiring premiums from the customer - designed to be niche products requiring little or no real commitment of the supplier.

Nonetheless this is an important step, continuing peer group and consumer pressure, and the continuing loss of business to real green suppliers will cause this attitude to change. To date there is some 30 MW of non-NFFO capacity in the UK, built for this new market. On one hand this doesn't sound like much, but coming at a time when the development of this was considered the commercial equivalent to walking on water, 30 MW is a real achievement.

The second factor at work is a likely obligation on public electricity suppliers (PESs) to have 10% renewable energy in their mix by 2010. If this legislation has teeth it will have considerable impact on the market place, but we'll have to wait for the Utilities Bill to see.

Green market potential

An increasing number of organisations already have environmental agendas, many others are adopting one. A major driver for this is consumer pressure as the public increasingly expect to see good environmental management and responsibility from companies they buy from, companies need to be green and need to be seen to be green. This pressure is set to increase as the environment continues to move further up everybody's agenda. Many organisations are responding to increasing governmental pressure in their efforts to become 'green chip', but whatever the driver, these changes in attitude can only be positive for the development of the green market place. Domestic consumer impact on the demand side of the market may well come about through the extension of the power to choose to that sector, through the final phase of deregulation of the electricity market last July.

There is an increasing interaction between the commercial and environmental sectors of our community. An excellent example of such a partnership is the joint venture between Ecotricity and Thames Water, with over 3,500 Thames sites now being supplied by the Renewable Energy Company, who are in turn buying Thames' own renewable capacity to add to the Ecotricity generating portfolio. The overall message is that the environment is a viable business opportunity.

Testament to the growing popularity of green electricity are the wide and diverse range of customers now being powered with Ecotricity. These represent the full spectrum of organisations, from those with a visible green agenda, like WWF-UK and the Co-operative Bank, both of which have an established and long term commitment to environmental improvement; public authorities who, as a sector, are leading the way in terms of specification of renewable energy in tenders; and at the opposite end of the spectrum, mainstream businesses and high profile opinion formers, the most recent example of which is the Millennium Dome.

have the power to deliver?

Whilst the stimulus for choosing Ecotricity is different for each sector, one factor was pivotal in the decision for all and that is the availability of Ecotricity at no premium above the brown electricity price.

The premium or no premium issue will undoubtedly govern the size of the market place. As a rule premium prices lead to niche markets, as illustrated by the green tariff take-up rates so far declared by the PESs, all of which are around 2%, or equivalent to the current renewable energy capacity in the UK. If demand for green electricity remained at 2% there would clearly be no stimulus for new capacity.

Obstacles to market growth

Whilst a credible consumer guide to green tariff selection could add value to the industry, the purpose of such a scheme should ultimately be to aid the expansion of the industry. However, the recent accreditation scheme, Future Energy (see *Energy World* September 1999), may achieve the opposite. The scheme accredits the offerings of any supplier which offers a green tariff with 100% renewable content or the zero % fund option (or a mixture of the two), it will not accredit anything in between - an all or nothing approach which ignores the commercial realities of green energy trading and the needs of new build investors. This is the chosen route of the public electricity suppliers who have flocked to obtain accreditation in order to give their tariffs some credibility, and for whom a vibrant and expanding market for green energy would require investment and involvement.

The Millennium Dome – perhaps not an unqualified success, but at least it runs on green power from the Renewable Energy Company

Boosts to market growth

The Climate Change Levy and potential tax breaks for investments in renewable energy will both further enable the green market place to 'price match' brown sources and so extend consumer choice, by improving the economics of new build projects.
The renewables exemption from the CCL will provide a major boost for green tariffs by pushing up brown prices.
And the proposed Suppliers' Obligation referred to in the Queen's speech, will provide a demand side boost to the sector by requiring PESs (who have the largest market share between them) to incorporate renewable energy in their supply mix.

The next move

Above all the market has to deliver new capacity, not just absorb existing capacity. Therein lies a challenge. Typically new generating projects are financed over a ten year period (under NFFO). Outside NFFO project finance is still a valid model and therefore power purchase agreements will be required for ten years or so. There are several differences between the NFFO and non NFFO situation; for example contracts in the electricity industry are usually no longer than two years - long term contracts can however be achieved.

Another difference is the financial standing of the organisation purchasing the power. NFFO contracts have very credible sponsors - credible purchasers for long term new build projects do exist and in the early days they will be large organisations. The most significant difference however is the pricing mechanism - over a ten year period what happens to the unit price set on day one? Under NFFO the renewable energy industry has had the benefit of annual RPI linkage, in the electricity sector such luxuries do not exist. Benchmarking prices to the market could be the answer - but this is a double-edged sword, presenting risks and benefits for both sides.

However, for any organisation willing and brave enough to take the real long-term view, new build renewable energy offers the potential to deliver energy with a price security that no other generation source can match.

Wind power, for example, is 'carbon tax proof', and will never be affected by increasing fossil fuel prices and other future pollution levies. Once the initial capital for

a turbine has been paid for, there are no fuel costs and ultimately wind is a very cheap source of energy with unit prices of around 1.5 p/kWh - looking very attractive against an uncertain future of rising brown prices.

Merchant wind power is a new concept in power supply, from the Next Generation Group, where organisations buy their electricity from their own on-site wind turbine without actually having to build, own or operate the machine, thereby avoiding any investment or development risk or cost. Merchant wind power is a highly economic and environmentally sound way to deliver renewable energy, by avoiding distribution costs and losses. Normally installed at industrial locations, planning consent is easier to obtain, traditionally a major hurdle in wind projects and a major block to the full utilisation of the UK's considerable wind resource.

Merchant wind power also goes hand in hand with a long term commitment from the customer, in return for which organisations are able to show their environmental agenda in a tangible, marketable form. This is another means to differentiate the company from competitors, and from which the customer can gain real economic advantages, from fuel price security and lower unit costs in the longer term.

The first of such projects has been negotiated with a major UK plc and is due for implementation in July.

Summary

The UK's green electricity market is alive and kicking and capable of delivering significant capacity towards government targets. A NFFO-type scheme is required in the medium term to run in parallel to the development of the green market, to support and bring to the market technologies and applications of technologies that are not there yet. For example offshore wind power, which has the potential to deliver half the 10% target alone and technologies such as solar power which need a market to fuel research and development and enable mass production to bring unit costs down. Meanwhile, supplier obligations will ensure a market place for technologies that are at or near the market price. The Climate Change Levy will reduce the cost of all three measures by raising the brown reference price and bringing renewable energy technologies another step closer to full commercialisation.

Development of a sustainable market for renewable energy sources and the implicit environmental gain that will provide requires a three-way partnership between government, consumers and suppliers.

Government needs to continue to improve the economic outlook for new renewable energy projects and to ensure that new rules for trading power do not prejudice intermittent sources. Consumers need to see the big picture and their role in climate change and respond with commitment via longer term power purchase agreements to support new build. Suppliers need to develop innovative ways to improve the economics of green supply and show flexibility in providing customers with a non-premium green product to enable more customers to play their part without eroding their competitiveness.

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Cornwall school opts for ground sourced heat pumps

Renewables in action – Charleston J&I School at St Austell in Cornwall has become the country's first to be heated and cooled by 'geothermal' energy, following the commissioning last summer of a closed loop, ground-coupled heat pump system from EarthEnergy.

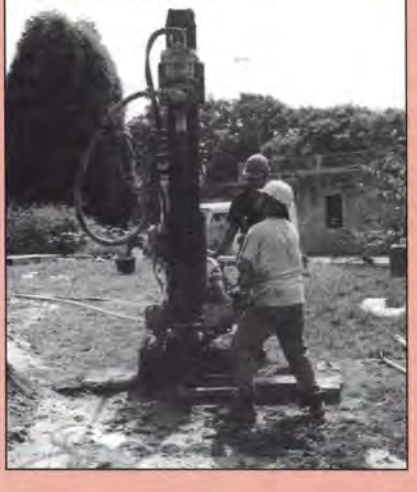
Cornwall County Council had decided to replace the roof-mounted air handling unit that employed direct electric heater batteries, and a conventional chiller, with a completely integrated unit that incorporates dual reverse cycle water source heat pumps. The heat pumps are connected to an array of 70 m deep boreholes drilled in the school grounds that are fitted with closed-loop ground heat exchangers. The ground loops extract stored, renewable energy from the ground in the heating season, and return it to the ground again in summer.

The ground heat exchanger is formed by inserting sealed loops of high density polyethylene pipe in a series of interconnected boreholes. A light anti-freeze mixture circulating in the sealed loops collects energy from the ground and delivers it to the electrically-driven heat pumps, which transfer the heat to the air being circulated around the building.

Because of the high overall energy efficiency of the EarthEnergy system, the installation is expected to deliver considerable savings in heating costs – as well as large reductions in overall carbon dioxide emissions. The only visible sign of the ground loop installation is an area of newly-sown grass.

Ground coupled water source heat pumps offer coefficients of performance of between three and four, says EarthEnergy, and are very popular in schools in the US and Canada due to their low running and maintenance costs.

Drilling the boreholes in the school grounds



Overshadowing in the solar city

By Dr Paul Littlefair, Environmental Engineering Centre, BRE

Solar energy has a big part to play in the city of the future, but overshadowing by obstructions can be a major issue. It is particularly important for passive solar heating in buildings, as tall obstructions can block low winter sun. This article suggests criteria to evaluate solar access in dense urban layouts, and ways to protect solar access to existing buildings are also examined.

Solar energy in its various forms will be more and more important in the buildings of tomorrow. However solar buildings have often been on 'green field' rural or suburban sites. To make a major impact in the future, solar design has to be widely applied in the city, making the most of obstructed urban sites rather than using up scarce open land. The environmental impacts of urban layout are the subject of an ongoing programme of research at BRE, funded by the DETR Construction Directorate and by the European Commission's JOULE and ALTENER research programmes.

For conventional solar water panels, obstruction is not usually a factor if they are roof mounted. However, obstruction is an important issue for photovoltaic facades. If part of a photovoltaic array is in shade, the output of the whole array can drop. Losses of 20-25% are common for facade mounted systems. As the European White Paper envisages 500,000 1 kW building integrated PV systems being installed in Europe by 2010, this loss in output is significant.

But obstructions are most important for passive solar design. The European White Paper anticipates a standard 10% of the heating and cooling energy demands in buildings should be met by passive solar, a projected contribution of 35 million tonnes of oil equivalent (Mtoe) by 2010. However this depends on access to the sun for heating, and access to natural ventilation sources for cooling. Diffuse daylighting is a key strategy in the cloudy climate of northern Europe, but large obstructions both reduce the amount of daylight entering and worsen its distribution in the room. For example a 45° obstruction can halve the daylight coming in and reduce lighting energy savings by 20-25%.

However site layout has the biggest impact on passive solar heating. Figure 1 shows why. It shows the area of the sun's motion visible from a south facing wall. With a 10° obstruction opposite (the lower dashed line shows the top of the obstruction), sunlight is received nearly all winter. But with a 40o obstruction (upper dotted line) all the winter sun is below the line of the obstruction on the diagram, and hence blocked. The benefits of solar heat gain are lost, but the overheating risk, due to unwanted solar gain in summer, still remains.

NBA Tectonics[1] quantified the energy impact of site layout on passive solar housing. They used low and medium density UK housing estates as case studies. Passive solar design can save 11% of the space heating in a typical dwelling; but these savings were reduced to less than half with non-ideal site layout.

Ensuring solar heat gain

The simplest way to ensure solar access is to limit obstruction angles[2]. At noon on 21 December the sun's altitude is 66.5° minus the site latitude. However keeping obstructions as low as this may not be feasible in urban sites. For London (51.5°N) this angle is only 15°. Also, in many urban sites obstructions can be uneven. As well as buildings opposite, there can be buildings at right angles and projections from the line of the solar facade. And the buildings opposite may themselves be a range of different heights. Under these circumstances it is almost guaranteed that some part of some building will encroach above the limiting obstruction angle.

One way to overcome this problem is to define an angular zone on plan within which obstructions need to be limited. Obstructions outside this zone can be ignored. The area of the sky between south east and south west includes nearly all the useful direct sunlight in winter (see Figure 2). Calculations for a south facing building in London show that three quarters of heating season solar gain comes from this zone of the sky.

For the limiting obstruction angle, at least in the UK, the midday sun angle on January 21/November 21 appears appropriate for urban locations. This is approximately 70° minus the site latitude on a south facing surface. In a densely packed urban site it seems sensible to take the angle from the centre of the glazing rather than the foot of the building. In London (51.5°N), 50% of the heating season solar gain comes from the area of sky above this angle between south-east and south-west directions. In Edinburgh (56°N) the proportion is over 70%[2].

An angular criterion like this can be useful at the early stages of building layout. If all the obstructions in the SE-SW zone are below the limiting angle then passive solar design should be feasible. If they are all above the limiting angle then it will usually be best to choose an alternative design strategy, or to build somewhere else. However often some of the zone will include obstructions above the limiting angle and some will be more lightly obstructed. In these circumstances a more detailed calculation technique will be required.

Here a solar gain calculation should be appropriate. Solar gain indicators[3,4] can be used for south facing glazing. An alternative is to use a computer-based technique, but it needs to treat the diffuse radiation blocked by obstructions properly. For example, TOWNSCOPE[5] has been developed by LEMA (University of Liege) as part of the research programme. It enables the 3D representation of part of an urban layout, with building envelopes and the open spaces between them; direct, diffuse and reflected radiation on surfaces can be calculated for particular days or months, or for the whole year. The incident sunlight can be plotted on different projections.

Loss of solar access to existing buildings

Often new development may restrict solar gain to existing buildings nearby. As the uptake of solar technologies increases, this is likely to be increasingly important. Yet outside the United States at least, this issue has not been widely addressed. There are conflicts of interest here. Owners of solar buildings rely on continued solar access. However adjoining owners also need to be able to develop their sites.

Also it is difficult to apply protection of solar access solely to solar buildings. Ordinary buildings benefit from solar gain too. It is unfair to allow loss of solar access to them and not to a building specifically designed to use solar energy. Defining a solar building also becomes an issue. Ordinary buildings could be retrofit with solar measures, turning them into solar ones. If this then restricted the ability of adjoining owners to build, the value of adjoining land could drop suddenly. In extreme circumstances, building owners who wanted to preserve their outlook could invest in solar measures with the sole purpose of restricting adjoining development. So protecting solar access to all buildings in a locality seems the most sensible strategy.

Local planning guidelines could include zoning of the city or town to allow for different levels of solar access in different types of built up area. Alternatively they might apply only in particular designated areas where renewable energy is specifically encouraged. There may be a problem when solar zoning is implemented. Overnight, future development of some sites may become restricted resulting in loss to their owners. A way round this is to apply solar access zoning only to areas of the city which are as yet undeveloped and where future development is still at the urban planning stage. Future building owners in those areas will be restricted in how high and wide they can build. But they will also have the benefits of guaranteed solar access.

Private legal agreements are also possible. When a solar estate is constructed a legal agreement could be drawn up protecting future solar access for each property. To own a house on the estate it would be necessary to sign this agreement. Alternatively the owner of a solar building may sell adjoining land on condition that future development there does not block solar access to the original building.

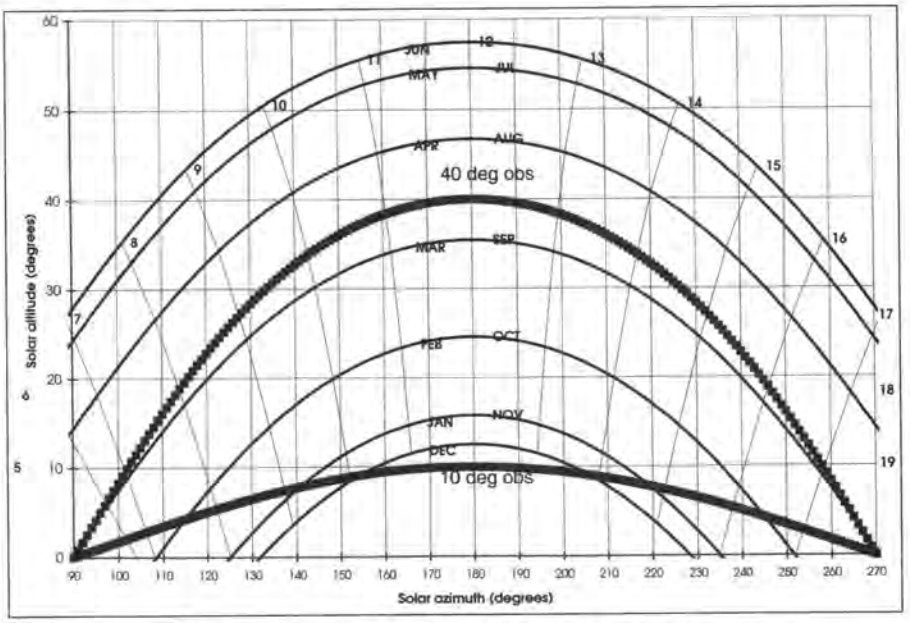


Figure 1: Sunpath diagram: latitude 55°, showing the line of two obstructions

Nearly all the work on protecting solar access comes from the United States[2], and is mainly aimed at protecting active solar collectors. Solar access planning is relatively easy there because the latitude is low and the sun higher in the sky. More land is available so buildings can be spaced out, and there is a regular rectilinear plot structure. For urban areas in other countries, further from the equator, techniques used in the US will probably be too restrictive.

Previous work at BRE[3], on protecting daylight to existing buildings, could provide the basis for a more flexible method. To safeguard solar access to an existing building:

- Use the angular zone criterion outlined in the previous section (obstruction angle at centre of solar facade less than 70° latitude within zone between SE and SW, Figure 2).
- If the above criterion is not met with the new building in place then calculate the heating season solar gain with and without the new building in place. If the solar gain is more than 0.9 times its former value then the reduction is small.

This technique is flexible but there are dangers, particularly if successive extensions are planned to the same building. Here the total impact on solar gain due to all the extensions ought to be calculated and compared with the guidance above.

The relative reduction technique outlined above can work well for general planning situations where existing buildings already have a wide variety of levels of solar access. However, when a solar estate is constructed with legal agreements to protect solar access for each property, it is probably best to define an area of the sky into which no future obstruction can encroach. This should be realistic. It should rule out future buildings which would cause a serious reduction in solar gain to an adjoining property, but not prevent smaller buildings which would have little or no impact on solar access. And, obviously, the criterion should be met with the solar estate as initially constructed. One way to ensure this is to use the same guidelines that were used in designing the estate in the first place.

Finding out more

A more general guide to all the different environmental aspects of urban design[6] has just been published by Construction Research Communications (tel 0207 505 6622). To launch the guide a seminar on sustainable urban design is being held at BRE on 22 February. For more details contact BRE Events on 01923 664532.

Acknowledgement

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Environment, Transport and the Regions. It partly based on work carried out for a JOULE project of the European Commission.

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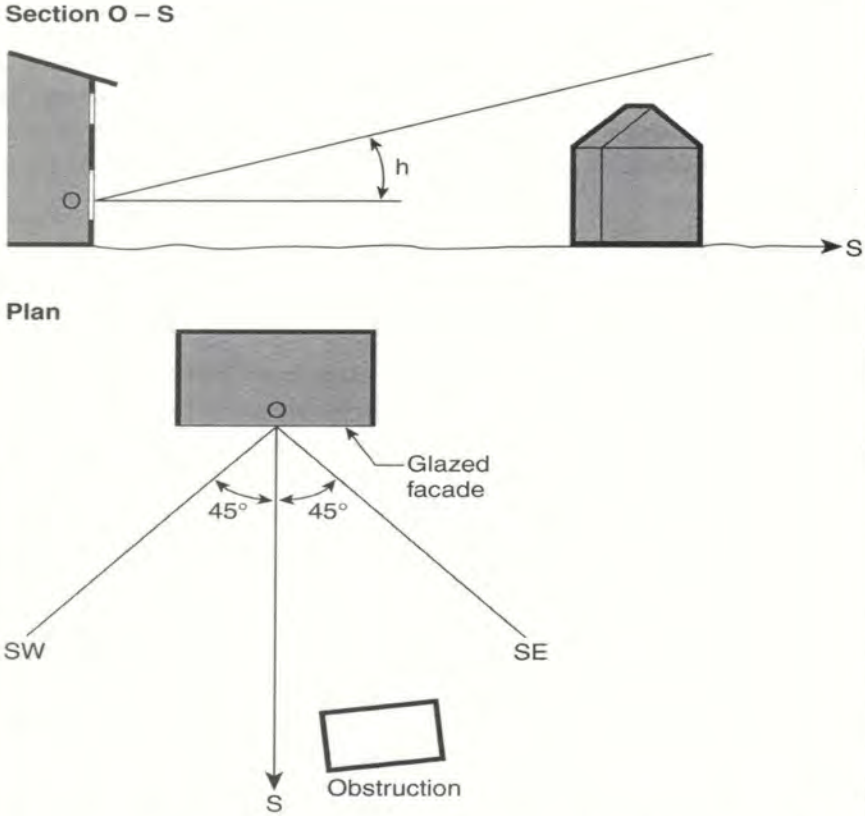


Figure 2: For solar access in urban areas the area of sky between south east and south west becomes important. Obstructions in this zone should ideally not exceed the critical angle h, 70° - latitude. For example for Edinburgh, 56°N, h would be 14°.

US PV market gathers momentum; daylighting increases productivity

Two new reports from the US suggest that moves to 'jump-start' the country's PV industry are starting to take effect, and that daylighting increases productivity.

Consumer-friendly products and the selective use of solar power are allowing solar photovoltaic products to gain a foothold in the US energy market, according to a new report by the Utility Photovoltaic Group (UPVG), a non-profit association of more than 90 energy service providers. The study documents the experiences of TEAM-UP, a public-private investment programme designed to jump-start the US market for solar electricity, and found that photovoltaic products are most readily adopted when they are sold as appliances, in standardised packages, rather than as a stand-alone power source. The marketing of renewable energy as 'green power' is also helping the US photovoltaic market.

Meanwhile, daylighting - the use of natural sunlight to light the interior of buildings - has long been recognised as an effective technique for saving energy while creating a more aesthetically pleasing environment. Now, recent reports from Pacific Gas and Electric Company (PG&E) demonstrate that daylighting also boosts productivity in businesses and classrooms. In a study on 108 stores operated by one chain retailer, daylighting was shown to increase sales by nearly 40%, says the report. In a separate study of school districts in three states, daylighting was found to increase test performance, typically by 10 to 20%.

Both reports were seen in EREN Network News, the weekly newsletter from the US Department of Energy's Energy Efficiency and renewable Energy Network (EREN) – on *www.eren.doe.government/*

Increasing the value of renewable

By N. Jenkins PhD, MIEE and G. Strbac PhD, Manchester Centre for Electrical Energy, UMIST

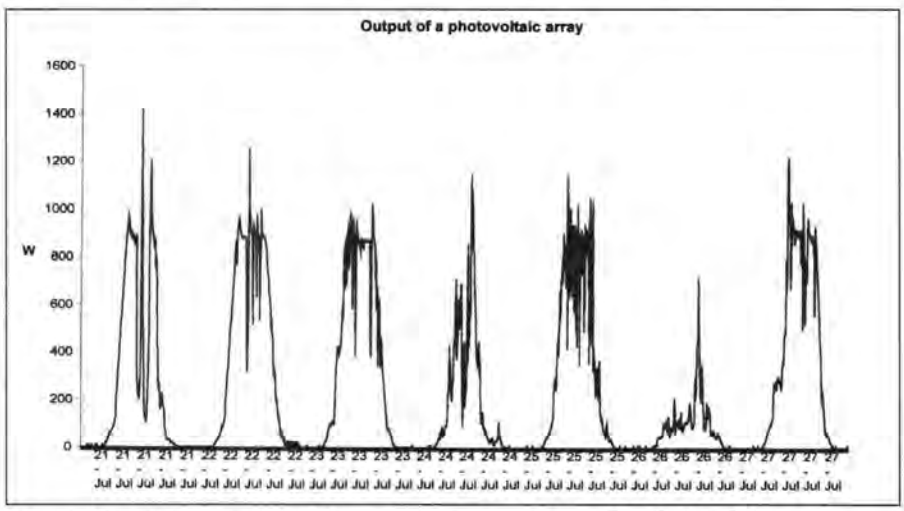
Energy storage has *the potential to increase the value of intermittent renewable energy generation in large electric power systems. Here, the characteristics of some of the main renewable sources are reviewed and the opportunities for the use of energy storage in association with renewable generation in a de-regulated power system are discussed. The article is based on a paper originally given at a conference on energy storage organised by the Institution of Mechanical Engineers and held in December 1999.*

The UK Government is working towards a target of renewable energy providing 10% of UK electricity supplies by 2010 which corresponds to approximately 40 TWh. As the load factor of the majority of new renewable sources is relatively low (say 30%), this target of 10 % electrical energy is likely to require the installation of some 10-15 GW of renewable generating capacity. This capacity is a significant fraction of the summer minimum loading of the UK system, which is under 20 GW. Under extreme circumstances, when low demand for electricity coincides with high output of renewable sources, system stability and frequency control will become of concern and there will be cost implications of such operation due to the increased amount of spinning reserve which will be required. Even without renewable generation the need for flexible generation plant at times of low demand, when nuclear plant and some base load gas stations with limited flexibility represent a high proportion of the generation, has already been recognised.

Intermittent renewable energy sources are presently connected into the UK power system without significant difficulty and with no requirement for energy storage. Further, at the levels of penetration presently anticipated in the UK, the intermittent nature of renewable energy generation is a commercial/economic question rather than one of fundamental technical limitation. A recent House of Lords Select Committee report was quite clear that "There are no insuperable problems in operating the UK electricity network with substantial amounts of renewable energy, including intermittent sources, well beyond the present 10% target". This view was shared by National Grid Company, who referred in their evidence to the typical winter week day load pick up of 12,000 MW (25% of peak demand) over a two hour period and estimated the cost of making more flexible plant available at "approximately £10 million for an additional 100 MW available all year", under current market conditions.

Renewable energy generation has an important role in assisting the UK in meeting its commitments in reducing emissions of greenhouse gases. Although renewable generation reduces production of *energy* from conventional sources, intermittent sources, (i.e. wind, photovoltaics, wave and run-of-the-river hydro) may not capable of displacing significant generating plant *capacity* due to their inherent intermittent nature and therefore, limited ability to provide a continuous supply and support system security requirements. Even in an ultimate renewable energy based system (with renewable generation producing the vast majority of electricity), considerable capacity of conventional plant may still be required. This would mean the power system acting as a backup or standby system, which obviously reduces the overall value of renewable generation. Clearly, with high penetrations of renewable energy the economic benefits of sources such as wind, solar and wave for electrical power generation may be considerably limited by the volatile nature of the availability of the primary supply.

Energy storage can address these problems. Many technologies have been developed with the aim of offering storage facilities. However, only pumped hydro schemes have achieved real penetration and acceptance due to their ability to provide both large power and energy outputs, although this technology is fundamentally constrained by geography and cost. Alternatives are now emerging with similar capabilities but without the siting and environmental constraints and with potentially lower cost. Clearly, such technology offers the possibility to enhance the value of renewable generation and enable it to contribute a more predictable capacity to the system. Furthermore, due to its rapid response and fast ramp rates, effective large scale energy storage offers a range of associated benefits, particularly in the area of system frequency control, reserve requirements and network reinforcement in case of distributed storage schemes.



Intermittent operation - the diagram shows the output of a photovoltaic array over a week.

sources with energy storage

Opportunities for energy storage with renewables

Intermittent renewable energy generation may be characterised by:

- high capital cost and the requirement to operate the plant whenever the resource is available,
- remote locations often away from strong electrical infrastructure,
- sometimes poor power quality,
- intermittent output, and
- low load factors.

The opportunities for energy storage to enhance the value of electric power systems may be listed as:

- operating reserve, against the loss of the largest generator,
- load following and maintaining power flows across critical interconnections,
- black start to re-energise critical generating station loads,
- voltage control, particularly on resistive networks,
- loss reduction, by reducing peak flows,
- investment deferrals:
  - generating plant
  - transmission and distribution circuit capacity
- power quality improvement,
- reliability enhancement.

However, following the paradigm shift in which electrical energy as a product is separated from its delivery as a service it is necessary to re-classify the contribution which energy storage can make to renewable generation. The fundamental division is, of course, between energy trading and transport services. This article focuses on the contribution of storage to transport services which are further grouped as shown below. The importance of this classification is that it is the conventional commercial structure found in modern de-regulated power systems.

Connection charges:

- Power quality improvement
- Optimal use of circuit capacity and local load matching
- Voltage and angular stability enhancement

Use of network charges:

- Distribution use of system charges
- Transmission use of system charges
- Network reliability enhancement
- Network losses

Generation ancillary services:

- Black start
- Generation reserve
- Frequency control

The immediate commercial opportunities for energy storage would appear to be with respect to generator connection where energy storage has the possibility to increase the capacity of renewable generating plant that may be connected at a voltage level.

Connection charges

In UK distribution networks, connection charges are levied on a 'deep charging' basis and the generator has to pay all the additional costs of the network associated with the connection. This leads to strong pressure to minimise connection costs and connect the generation at the lowest possible voltage level (and hence at relatively low short-circuit levels).

A number of new renewable generator technologies deliver rapidly varying output power (eg wind, wave and photovoltaics). When a large number of relatively small generators are connected to a strong electrical network then induced voltage 'flicker' tends not to be a constraint on the connection of the generators as other voltage limits (eg voltage rise or stability) tend to be reached first. However for large single installations such as a single large turbine, large photovoltaic array or wave generator connected to a high source impedance network then voltage flicker is often the limiting constraint. In such distribution networks it is common to find source impedance X/R ratios as low as unity and so reactive power compensators tend to be of limited effect.

For large numbers of relatively small generators (eg wind farms), the limit to the capacity which may be connected is often the steady state voltage rise. This is generally calculated on the basis of minimum network load and maximum generation. Even if the maximum voltage limit is shown to be violated only once a year then permission to connect the generator will be refused. In transmission systems, network voltages may be controlled effectively by adjusting the flow of reactive power. In distribution networks with low X/R ratios this method of voltage control can require very large VAr flows and hence high associated electrical losses.

There are two potential solutions:

- constraining the generation in response to network voltage conditions, and
- storing energy for release at a later time when the local network load has increased.

For occasional constraints it is likely to be more economic reduce generation but if the constraints occur frequently then energy storage may be justified.

The Danish use of rural CHP systems illustrates an interesting approach to energy storage (even though is it heat energy which is stored). Medium sized (up to 10 MW) reciprocating engines or gas turbines, fed from natural gas, are used to provide both electrical energy and district heating. Energy storage is used to store heat energy in large hot water tanks so that the CHP sets may be run during the times of peak network electrical load and at rated output. Thus, although the energy is stored in the form of heat the storage systems allows the operation of the CHP sets at times of maximum benefit to the electrical distribution system.

A number of renewable energy technologies use induction generators and it has been shown that there is a limit to the capacity which may be connected to the distribution network before voltage instability becomes a potential hazard. This has been identified as a significant issue for the connection of large offshore wind farms using AC circuits. Although some improvement may be obtained using reactive power compensation it is likely that much greater improvements in stability could be achieved using real power injection and energy storage.

At present the question of angular (transient) stability of synchronous dispersed renewable generation is of limited interest as if the generation trips for a remote fault then it is re-synchronised after some while and only some renewable energy is lost.

However, once dispersed renewable generation starts to comprise a significant fraction of the system generation its dynamic performance will assume considerable importance as loosing generation unnecessarily will no longer be acceptable. Again, energy storage is likely to have a commercial role as the alternatives are increasing the short-circuit capacity of the network or installing faster network protection. Both of these options are likely to be extremely expensive.

Use of network charges

Energy storage devices can, in principle, be built anywhere. This flexibility may be utilised to increase the benefit of the plant to the distribution and transmission network capital and operating costs and enhance the network reliability performance.

If the use of network charges are cost-reflective, storage devices sited in favourable locations from the network investment and operating cost perspective, should benefit from negative use of system charges. For example, the value of investment in network reinforcement that can be substituted by favourably located energy storage devices should be reflected through the use of system charges. Furthermore, as the regulation of network businesses is focusing more and more on service quality based revenue recovery, the value of storage devices that can provide alternative supplies should also be reflected through use of system charges. At present, network tariffs are only partially cost reflective, but the trends in their development suggest potential opportunities for energy storage.

In the context of the use of energy storage with renewable generation, it is interesting to examine the potential of storage in the context of the UK transmission network. Due to locational development of generation and demand in England, Wales and Scotland, there is a North to South power flow pattern across the transmission system throughout the year. The existing capability of the transmission network is generally sufficient to carry these power flows although there are some occasional restrictions. Due to large flows the incremental differential in losses between North and South is in the range of 8-12%, which is the amount for which the value of generation in North is less than that in the South. Hence, energy storage located in the South should benefit through transmission loss adjustment factors, which are yet to be established.

Another issue that is of interest here is the use of favourably located energy storage devices to support unfavourably located renewable sources. Some of future renewable generation technologies may be expected to locate predominantly in the North as a result of higher primary source energy densities. Hence they have the potential to increase considerably North to South power flows and this may cause a need for system reinforcement and lead to higher losses. Energy storage devices could reduce this indirectly by displacing generation located in the North during the periods of peak flows from North to South. Clearly, storage plant located in the South should benefit from negative transmission-use-of-system charges.

For the application of energy storage at the distribution level, it is important to remember that the ability of distribution networks to transport energy is usually voltage limited. Due to the nature of distribution network, both active and reactive power flows are important for the management of voltage profiles on the distribution network. Hence, the use of energy storage could be optimised in order to control the voltage in local networks and hence postpone reinforcement and reduce losses. Again, if the distribution use of system charges were cost reflective, favourably located storage plant should benefit from negative use of system charges. Similarly, any benefit from reduction of losses should be reflected through the appropriate loss adjustment factors.

The focus in present regulation of distribution networks is moving towards network performance, currently measured through 'Customer Minutes Lost'. In cases when available transmission circuits are not able to supply all connected load and some of it must be shed, the ability of storage to reduce the amount of load that must be shed would clearly be very beneficial. The corresponding pricing mechanisms, through adequate use of system charges or distribution network ancillary services contracts should quantify the value of storage in this context.

Generation ancillary services

At present in the UK, renewable generating plants are not despatched and take no part in provision of generation ancillary services (ie black start, frequency control and generation reserve). Clearly it is technically impossible for intermittent renewable generators, such as wind power or photovoltaics, to increase their output above the instantaneous available energy resource. However, it is possible to arrange for their output to be reduced in response to system conditions. It is likely that this degree of control will be required on the new offshore (150 MW) wind farms now being planned in Denmark. If cost effective energy storage becomes available then both increase and reduction of power output from renewable energy plant will become possible and the renewable energy plants will begin to resemble conventional fossil fired generation in their response to network frequency.

The potential provision of black start services raises the interesting possibility of islanded sections of the network being supplied from energy storage devices, perhaps supplemented by renewable generation, during system restoration. If this mode of operation is permissible during restoration then it would appear to be appropriate at other times. The operation of islanded sections of network fed from fossil fuelled embedded generators is already being considered in Holland.

The evidence of the National Grid Company to the House of Lords indicated that once significant penetrations of intermittent renewable generation was connected to the system (e.g. more than 1500 MW of wind generation) then it would become necessary to purchase additional reserve. This is clearly an opportunity for energy storage perhaps in conjunction with improved forecasting of the wind energy resource.

Contact the authors at n.jenkins@umist.ac.uk and g.strbac@umist.ac.uk

Poultry power

By Geoff Loram MInstE

Geoff Loram visits a UK power plant fuelled by poultry litter and forestry wastes.

You can't miss it, you will see the chimney as you come round the Thetford by-pass" said David Raubenheimer, Project Manager for Fibrowatt's new 40 MW poultry litter fired generating plant. Since I had been associated in a small way with the original design of the plant, several years ago, I was looking forward to seeing how it had developed from those early days. In fact that view of the top of the tall, slender chimney above the trees of Thetford Forest, is about all the ordinary citizen sees of the plant as it is tucked away in a hollow off the road and well screened by trees.

The world's largest generating station fuelled by poultry litter and Europe's largest biomass plant has now been in commission for several months and, subject to sorting out some teething problems, the owner and operator of the plant, Fibrowatt Ltd. are very happy with its performance. Indeed, on the day of my visit the plant was operating slightly above the boiler's MCR.

The first impression I got was of a very quiet plant and it was evident that a lot of attention had been paid to this aspect of design; for instance, the air-draught cooling towers in the condenser circuit were fitted with large diameter low speed fans that were virtually silent. Noise from the plant was barely audible from the road a couple of hundred metres away. You would not expect a plant burning poultry litter to be exactly odour–free and neither is it, but careful design has kept the smells to a level that is considerably better than tolerable; and that is on the plant itself – move away 100 m and they are hardly noticeable; drawing the combustion air in through the litter delivery and storage area is one of the main means of achieving this.

This is a large plant in energy-from-waste or, more accurately, biomass terms; it absorbs between 1,900 and 2,500 tonnes of poultry litter every weekday and burns between 1,000 and 2,500 tonnes of litter or forestry waste every day. The incoming fuel is tipped into walking floor reception hoppers from which it is conveyed to a very large storage bunker where it is evenly distributed by a tripper conveyor. The forestry wastes, which constitute 10-20% of the energy input, are blended adequately by depositing the occasional layer on top of the litter. The fuel is conveyed out of the bunker by a moving auger that travels the length of the bunker feeding onto a conveyor system taking it directly to the boiler feed hopper. The whole system works on a `first in, first out' principle and was designed to reduce the significant dust problem associated with grab crane handling of the litter at Fibrowatt's other plants.

The world's largest poultry litter fuelled power station

The boiler has a fairly conventional Foster Wheeler Canada chain grate onto which the fuel is injected by air; it has a generously sized waterwall combustion section leading to a superheater and evaporator pass and turning down through a double pass economiser and air heater section. The boiler was developed by Foster Wheeler using experience gained at Fibrowatt's earlier plants at Eye, Suffolk and Glanford, North Lincolnshire.

Apart from the fine ash the flue gases are comparatively clean and the only treatment needed is a simple lime spray into the ducting before the baghouse filter. The ash which has a useful phosphorous and potassium content but is low on nitrates, is conveyed from the grate and the baghouse to a conditioning plant and stored in four tall silos ready for sale as a fertiliser.

You might not consider poultry litter as exactly a `high-tech' fuel but the Thetford plant's control system certainly is. It starts at the weighbridge where each load is identified as to its source and recorded; the loads are sampled on delivery to the reception hopper and the samples are analysed for moisture and ash content in the laboratory which also makes periodic checks on the fuel's CV. Poultry litter tends to have a high moisture content and is unacceptable as a fuel if it gets too high; the litter producers are able to control the MC and these arrangements allow Fibrowatt to ensure that they only receive litter with an acceptable MC.

The economic viability of the plant is dependent on the enhanced electricity price paid under the NFFO scheme. That subsidy, however, buys some environmental benefits as the plant produces no `new' carbon dioxide, methane production is avoided, the dispersal of phosphates and nitrates to land is controlled.

Cutting carbon – how feasible

Sir

In the November/December 1999 issue of *Energy World*, Friends of the Earth (FoE) put forward their arguments as to why nuclear power should be phased out in the UK. Part of the justification was that the FoE report entitled *Cutting CO_2 – Creating Jobs* showed that, by 2010, through a combination of renewable supplies and gas CHP plant, nuclear plant can be phased out and CO_2 output can be reduced. The proposals in the report have been evaluated by John Bond and Paul Spare of the Institute's Nuclear Power Special Interest Group and their findings are presented below.

Before reviewing the numerical data, there is one important aspect (fault is not too strong a word) of the FoE document that must be mentioned at the outset. Nowhere does the report address the practicality, the engineering, the resources, the planning nor logistics issues that have to be addressed to construct the new plant that will bring the CO_2 output reduction. There is an automatic presumption that finance can be obtained and construction can be achieved – by whatever means of coercion might prove necessary, one is forced to assume.

It is rather akin to claiming you know how to land a man on Mars by saying that the journey will be 400 million miles and take three years, then ignore all the difficult parts about transport and survival.

The practical difficulties of achieving the report's objectives are soon revealed when a few engineering calculations are undertaken.

The report discusses two scenarios for CO_2 reduction, of 20% and 30% respectively and the claims for the 30% reduction case are reviewed below.

Table 13 of the FoE publication (reproduced below) predicts a split of installed capacity in the 30% CO_2 reduction case by 2010 of:

- 3,608 MW onshore wind,
- 6,799 MW wood,
- 2,091 MW wave, and
- 29,048 MW gas-fired CHP.

	1995	2000	2005	2010
CHP	5,375	25,089	27,253	29,048
Renewables:				
Large Hydro	1,411	1,414	1,417	1,652
Small Hydro	28	346	658	847
Onshore Wind	28	147	2,475	3,608
Offshore Wind	0	9	2,027	3,119
PV	0	160	360	379
Wood	1,506	2,973	6,411	6,799
Agricultural waste	241	750	1,501	2,797
Sewage sludge	183	183	183	183
LFG	119	370	413	502
Geothermal	2	2	2	2
Wave	0	0	709	2,091
Tidal	0	0	0	1,681
Biofuels	0	36	777	1,144
Total	3,518	6,390	16,932	24,804

Total installed capacity (MW) for renewable energy and cogeneration to 2010
30% carbon dioxide reduction target

Taking each of these in turn:

Wind power

A typical large wind turbine can produce about 0.5 MW maximum. To generate the 3,608 MW proposed by FoE will require such 7,216 turbines. As the average output of a wind turbine is typically only 25% of its maximum, to meet a steady customer demand of 3,608 MW would require 28,864 turbines. That represents an average of 11 being brought on stream every working day from now to 2010. This might be reduced to eight if the very largest 800 kW turbines were to be installed everywhere.

Even if the equipment were available, there would be widespread opposition to the environmental damage that the construction of 28,000 wind generators would bring, especially since the total output would amount to more than 5% of generating capacity. National Wind Power has recently been refused planning permission for two small developments and the FoE proposal would require planning approval for about 1000 sites. The claim that 3,608 MW of onshore wind can be available by 2010 is therefore a gross exaggeration.

If this reasoning is not correct, than perhaps Friends of the Earth will produce a map showing where the first 100 of these wind energy sites are to be situated.

Woodburning

Wood suffers from a similar problem to wind power in that it has low energy density, compared with other fuels on offer. The Forestry Commission quote a production from coppicing of 6.8 t/acre of wood per annum. The calorific value of the product will be at best bout 40% that of crude oil, so 6.8 t/acre wood = 2.8t/acre of oil equivalent (toe).

The annual fuel demand for electricity generation in the UK is about 75 million toe. Now 1.8 mtoe is about equivalent to 1000 MW. To produce 6,799 MW by wood burning would require wood equivalent to 12.2 million toe ie about 4.5 million acres

is the renewables solution?

of new coppice forest. This is about 7100 square miles or about the area of mainland Wales. The planting, cutting, transport and logistics problems associated with this quantity of material and the millions of vehicle movements would cause terrible damage to rural areas, plus all the smoke and particles from combustion. Clearly, no rigorous analysis of the practicality of this option has been undertaken. This is a measure of the problem of trying to replace British Energy's nuclear plant by a so-called 'environmentally-friendly' option.

Perhaps Friends of the Earth will describe which areas of the UK are to be planted most intensively – upland and moorland, existing woodland or arable fields. The failure to identify any sites for new coppice areas in the FoE report is unfortunate, but not surprising, as the policy will involve the total destruction of enormous tracts of the English countryside.

Wave power

ETSU have forecast that a typical average output of 1 MW per 60 m of wavepower system could be achieved around the UK coasts.

The FoE document proposes 2,091 MW of wave power. Using the ETSU data, wave power plant with a total length of over 125 km would be required – perhaps five units 25 km long. These would presumably be located off the coast of Wales or Scotland or Cornwall. To withstand the most adverse storm conditions, the structures will look like oil platforms. The weight of the structure if based offshore would be as a minimum 50 t/m or about 5 million tons in total. Have the implications of such plant been appraised? The visual impact of the plant, the damage to the shore line, environmental damage to the wild life and from quarrying the material, sediment movements and other erosion effects would be severe. Feasibility studies would require years of modelling. There is no split offered in the document between coastal and off-shore, but onshore systems would have even greater impact on the unspoilt environment, even if there were to be 1000 of them generating at 2 MW.

Again, perhaps Friends of the Earth could produce a map showing the distribution, electrical outputs and the sizes of the plants that would be built – and the routes of additional high voltage transmission lines.

CHP and the exhaustion of natural gas

The Friends of the Earth model proposes 29,048 MW of gas-fired CHP plant. There are three very serious faults with this proposal:

- CHP installations require that electricity and heat requirements are well matched over a limited range. Unlike plants that generate only electricity, suitable industrial, commercial or domestic heat loads have to be conveniently close.
- Increasing the consumption of natural gas will be accompanied by increased methane losses from the distribution network work. This is not allowed for and methane is a substantially more effective greenhouse gas than carbon dioxide.
- No policy can be claimed to be sustainable, and yet this has as its main component a fuel that be in serious decline by 2010 and facing exhaustion in a further 20 years.

The most serious factor that this proposal does not recognise is that there is no obvious replacement for natural gas for the domestic and commercial consumer.

There are 20 million households that depend upon natural gas for heating and other domestic purposes. Larger quantities being used to generate electricity will accelerate its exhaustion (estimated available gas supplies fell by about 10% last year). Without a replacement, these 20 million households will need to derive their heat in 20-30 years' time, not from natural gas, but from electricity. This could mean a tripling of the demand on the electricity distribution network because, while the average electrical demand per household is around 3 kW, the average gas demand per household is 10 kW.

Even if there is a move to use hydrogen in place of natural gas, a fuel source is required to power the electrolysis plants to split the hydrogen from oxygen. There is no need to mention the obvious power source for that.

Summary

Supply interruptions are largely unknown in the UK and the position has changed very little since privatisation. The risks of widespread and long-term interruptions would be far greater in any proposal that relies upon a large renewable element. Renewables are prone to short-term common-mode failure ie a winter anticyclone over the country would result in minimal wind power/solar power and little wave power at the same time and might be forecast only three days in advance. A small range of crop species could all be vulnerable to the same disease or climatic problem.

The proposals would introduce very grave risks of supply interruptions and even the collapse of a significant proportion of electricity supplies. Long term interruptions could easily be followed by food shortages, deaths from hypothermia and to the collapse of our system of wealth creation.

From almost every aspect that the proposals are viewed, they show very serious deficiencies. Whilst not opposing the growth of renewable supplies, it is dangerous to have misplaced confidence in them. It must also be remembered that their small contribution will also be accompanied by very undesirable environmental drawbacks.

Paul Spare
John Bond

The editor welcomes letters, particularly short contributions, on anything that has appeared in Energy World, and on wider energy matters.

Events

February 2000

Energy and the consumer: lessons from the end of the 20th century
RSA lecture, 14 February, London
Details from the RSA, tel: 020 7930 5115, e-mail: *general@rsa-uk.demon.co.uk*
In association with the Institute of Energy

Low energy air conditioning systems
Course, 16 February, London, £198
Details from Mid Career College, tel: 01223 880016, e-mail: *courses@mid-career-college.ac.uk*

LNG 2000
Conference, 16-17 February, London
Details from SMi Ltd, 020 7252 2222, e-mail: *customer_services@smiconferences.co.uk*

Making markets in power
RSA lecture, 21 February, London
Details from the RSA, tel: 020 7930 5115, e-mail: *general@rsa-uk.demon.co.uk*
In association with the Institute of Energy

Benchmarking for utilities
Conference, 22-23 February, London, £995 + VAT
Details from IIR Ltd, tel: 020 7915 5055, e-mail: *registration@iir-conferences.com*

Renewable energy – sources and efficient applications
Conference, 23 February, Folkestone, Kent, £55
Details from RF Colvile at the Society of Retired Engineers in SE Kent, tel: 01303 850008, e-mail: *colvile@adept.co.uk*

Utilities online
Conference, 23-24 February, London, £995 + VAT
Details from IQPC, tel: 020 7430 7300, e-mail: *utilities@iqpc.co.uk*

Flexible utilities billing systems
Conference, 23-24 February, London, £999 + VAT
Details from IIR Ltd, tel: 020 7915 5055, e-mail: *registration@iir-conferences.com*

Combined heat & power
Conference, 24-25 February, London, £1295 + VAT
Details from ICM Conferences Ltd, tel: 020 7436 5735, fax: 020 7436 5741

Thermal storage systems
Course, 28 February, London
Details from Mid Career College, tel: 01223 880016, e-mail: *courses@mid-career-college.ac.uk*

Energy markets or energy policy: which way prosperity?
RSA lecture, 28 February, London
Details from the RSA, tel: 020 7930 5115, e-mail: *general@rsa-uk.demon.co.uk*
In association with the Institute of Energy

Building energy analysis and simulation
Course, 28-29 February, London, £335. Details from the Centre for Continuing Professional Development, South Bank University, tel: 020 7815 7675, e-mail: *normanld@vax.sbu.ac.uk*

Opportunities in the converging gas & electricity industries
Conference, 28-29 February, London, £1195 + VAT
Details from cwc associates, tel: 020 7707 6161, e-mail: *bookings@cwconferences.co.uk*

Boilerhouse management
Course, 29 February, London, £198. Details from Mid Career College, tel: 01223 880016, e-mail: *courses@mid-career-college.ac.uk*

Multi-utility infrastructure
Conference and exhibition, 29 February - 1 March, Birmingham, £435 + VAT
Details from the Pipeline Industries Guild, tel: 020 7235 7938, fax: 020 7235 0074

Stationary fuel cells
Conference, 29 February - 2 March, London, £995 + VAT
Details from IQPC, tel: 020 7430 7300, fax: 020 7430 7301

March 2000

Energy costs in the food and allied industries
Seminar, 2 March, London, £220 + VAT. Details from Alison Payton, IMechE, tel: 0171 304 6828, e-mail: *a_payton@imeche.org.uk*
In association with the Institute of Energy

Natural gas – the commercial and political challenges
Course, 5-10 March, Wiltshire, £2800 + VAT
Details from Alphatania, fax: 020 7650 1405, e-mail: *training@alphatania.com*

Energy saver
Course, 7-9 March, Swindon, £875 + VAT
Details from NIFES Consulting Group, tel: 0115 984 4944, e-mail: *training@nifes.co.uk*

Energy management
The Institute of Energy short course, 8 March, Loughborough, £99 + VAT
Details from Katie Howe, Tel: 020 7580 7124, email:*kthowe@ioe.org.uk*

A world of thermography
Conference, 9-11 March, Bath
Details from Colin Pearson at BSRIA, tel: 01344 426511, e-mail: *ukta@bsria.co.uk*

The changing land of Europe
European conference on renewable energy and agriculture, 12-14 March, The Netherlands
Details from European Media Marketing, tel: 020 8289 8989, e-mail: *sustain@emmi.co.uk*

Natural gas processing
Course, 13-15 March, Amsterdam, $1575
Details from The Center for Professional Advancement, tel: +31 20 638 2806, fax: +31 20 620 2136

The National Energy Management Exhibition - NEMEX'99

Lord Witty (left) discussing the work of the Institute with Louise Evans at NEMEX'99 and Iain Ure of DETR (right)

The National Energy Management Exhibition (NEMEX), held in hall 19 at the NEC in Birmingham, always presents the Institute with the opportunity to meet new members as well as to catch up face-to-face with current members and their views on our products and services in the field of energy management. At last November's NEMEX we were fortunate to have current members helping us out on the stand. Need we say more? The Institute of Energy IS its members.

The Institute's presence at the event saw the launch of the "Bitesize VQ in Managing Energy", with Maria Adams leading a workshop attended by 20 people. Regional Short Courses support this small-scale VQ, which gives professionals a chance to gain recognition for their achievements in specific areas of energy management. The are 9 units in an NVQ or SVQ. Evidence for these units can now be compiled and certificated without the need for a commitment to the entire award. The regional Introductory Short Courses in Managing Energy can start the process of national recognition.

The Institute's branches are helping to co-ordinate the short course programme alongside HQ staff. As the accrediting body for both The Energy Efficiency Accreditation Scheme and The Energy Manager of the Year Award, the Institute is helping professionals and their organisations to achieve their targets and gain recognition on the way!

Group Membership was also given a boost at The Institute of Energy's reception at the Metropole Hotel following the first day of NEMEX, when PowerGen, Datum Solutions and Fortum (formally IVO Energy) explained the merits of working closer with the professional body for energy. We are grateful to the sponsors, staff and members for all their support. NEMEX 2000 will take place in Hall 19, at the NEC in Birmingham next year on November 1st and 2nd.

A lively reception was held at the Metropole Hotel to promote Group Membership

Learning to save energy and reduce waste

For some time now we have been reporting the various successes of the Partnerships for Best Practice Initiative in bringing fresh ideas about energy and waste reduction from staff at all levels. The Institute of Energy and one other of the partners in the initiative, the Amalgamated Engineering and Electrical Union have recently piloted a Learning Programme at the AEEU Training Centre in Esher, Surrey. This is the second part of the pilot aimed at bringing energy and waste reduction issues into the dialogue between management and the workforce.

The event ran for two days. Part of the programme involved aligning health and safety to environmental issues as well as learning communication skills for use in putting forward energy/waste saving projects. Institute staff led the sessions alongside AEEU representatives and Dr Uly Ma from the Best Practice Programme.
Energy and waste saving projects resulting from the day included a scheme to reclaim oil from presses and two lighting projects involving little investment.

For more details about the Partnerships for Best Practice initiative contact Katie Howe
tel: 020 7580 7124,
fax: 020 7580 4420,
email: *kthowe@ioe.org.uk*

Energy Management - the simple route to gaining recognition

Not everyone has the time, inclination or opportunity to achieve an entire professional qualification. However, recognition for aspects of your work can be simple and affordable to achieve.

If some of the units from the S/NVQ 4 in Managing Energy seem fitting to your role, why not consider gaining a S/NVQ Unit Certificate in Managing Energy?

It couldn't be easier. Gaining an S/NVQ certificate is far from time consuming as it is based on the provision of evidence from your daily activities. For example, if you are in the process of running a staff awareness campaign you simply slot your posters, newsletters, policy documents and any other evidence into a portfolio to use for unit E3 - Promoting Energy Efficiency. Once registered, you are entitled to guidance from a Development Adviser, who will help you develop a portfolio of evidence. Your portfolio will then be passed to an assessor for final assessment, this person may contact you during the assessment process to check that your evidence is Valid, Authentic, Current and Sufficient - the golden rules of a good portfolio.

S/NVQ units cost £260 each, which includes registration, a candidate pack, advice, assessment and a certificate if you succeed.

Mandatory Units of the S/NVQ in Managing Energy

E2	Provide advice on the development and implementation of energy policies
E4	Monitor and evaluate energy efficiency
E6	Provide advice and support for the development of energy efficient practices
E7	Provide advice and support for the development and implementation of systems to measure energy usage
E8	Provide advice and support for improving energy efficiency
C2	Develop your own resources (unit from the management standards)

Optional Units of the S/NVQ in Managing Energy

E1	Identify the scope for improvement in the way the organisation manages energy
E3	Promote energy efficiency
E5	Identify improvements to energy efficiency
A2	Manage activities to meet requirements
B4	Determine the effective use of resources
C5	Develop productive working relationships
C10	Develop teams and individuals to enhance performance
D2	Facilitate meetings
E9	Determine conditions in the market for supplies
F3	Manage continuous quality improvement

How to start?

Why not consider attending one of the regional Short Courses in Managing Energy to begin the process? This course offers an introduction to energy management as a refresher course or to guide you if you are new to the role. The courses are based on The National Standards for Managing Energy and include:

- Energy policy
- Investments for energy efficiency
- The National Standards for Managing Energy
- The principles of monitoring and targeting
- Staff awareness and motivation programmes
- Energy management structure and accountability
- Introduction to site services - lighting, bms etc.

Forthcoming introductory short courses in energy management

8 March 2000, Loughborough
18 April 2000, Bristol
18 May 2000, Yorkshire
7 June 2000, Midlands
5 September 2000, Glasgow
Course Fees:
Member £99 +VAT
Non-member £120 + VAT
Contact Katie Howe at the Institute on
Tel: 020 7580 7124 or
email: *kthowe@ioe.org.uk*
for more information.

AMInstE gives you recognition

Could you gain professional recognition for managing energy?

Do you have:
Five years practical energy management experience? And an N/SVQ level 4 in Managing Energy? Or an HND or an ordinary degree qualification?

The Institute of Energy can now provide you with the recognition you deserve!

We are the first professional body to link an N/SVQ award directly to our membership criteria, permitting energy managers to seek recognition without compromising professional standards, providing membership in the grade of Associate Member (AMInstE).

Branch Events

FEBRUARY 2000

NORTH WEST BRANCH

Wednesday 2 February
One day short course in Energy Management.
Contact Ms K Howe, Institute of Energy, tel: 020 7580 0008, email: *kthowe@ioe.org.uk*

MIDLAND BRANCH

Thursday 3 February, 7.00pm
Austin Court
'Emerging Energy Technologies - a glimpse of the future' - Mr J Masters (Energy International UK) & Dr A Heaton (EA Technology). Joint meeting with The Institution of Electrical Engineers. Contact Mr H Freeman, tel: 0121 353 2397, email: *hfreeman@talk21.com*

SCOTTISH BRANCH

Wednesday 9 February
Technical visit to Shettleston geothermal/solar energy development.
Contact J Currie,
tel: 0131 455 2253
Email: *j.currie@napier.ac.uk*

YORKSHIRE BRANCH

Wednesday 16 February, 2.30pm
Prof Alan Williams' Retirement. Lecture: 'Energy for a New Millennium' at the Dept of Fuel & Energy, Leeds University. Contact A Mallalieu, tel: 0113 276 8888 Email: *AM@evanstabouniversal.co.uk*

SOUTH WALES & WEST OF ENGLAND BRANCH

Friday 25 February
27th Annual Idris Jones Memorial Lecture & Luncheon at Cardiff Castle. Contact A Boulton, tel: 0117 932 3322 Email: *a.boulton@talk21.com*

MARCH 2000

MIDLAND BRANCH

Thursday 2 March, 7.00pm
Austin Court
'Fire and Explosion Hazards & their mitigation' - Dr P Cleaver (BG Technology). Joint meeting with The Safety & Reliability Society.
Contact Mr H Freeman,
tel: 0121 353 2397
Email: *hfreeman@talk21.com*

EAST MIDLANDS BRANCH

Wednesday 8 March
One day short course in Energy Management.
Contact Ms K Howe,
Institute of Energy,
tel: 020 7580 0008,
email: *kthowe@ioe.org.uk*

NORTH WEST BRANCH

Date to be announced 5.30 for 6.00pm
A talk on Explosive Hazards by B Jones at AEA Technology, Risley. Contact M Worthington tel: 0151 448 6115. Email: *Worthington_Maurice_R@lilly.com*

YORKSHIRE BRANCH

Tuesday 14 March, 7.30pm
'The Vauxhall 6 cylinder engine'. Joint meeting with the Institute of Petroleum at Cedar Court Hotel. Contact A Mallalieu, tel: 0113 276 8888. Email: *AM@evanstabouniversal.co.uk*

LONDON & HOME COUNTIES BRANCH

Wednesday 15 March, 6.00pm
Brampton Park Golf Club, Cambridge
Paper on 'High Accuracy Energy & Volume Controls'. Joint meeting with The Institution of Gas Engineers.
Contact D Barber,
tel: 01494 783142,
email: *Rufusred@aol.com*

SOUTH COAST BRANCH

Wednesday 15th March
Visit to National Air Traffic Control Centre, Swanwick Meeting at 6.30 pm followed by tour of building. Limited places so please contact Mr T Smith, tel 020 7410 6141
Email *tim.smith@statoil.com*

SOUTH WALES & WEST OF ENGLAND BRANCH

Thursday 16 March, 6.30pm
Young Persons' Short Paper Evening. Jointly sponsored by the University of the West of England. To be held at the Frenchay Campus at the university. Contact A Boulton, tel: 0117 932 3322
Email: *a.boulton@talk21.com*

LONDON & HOME COUNTIES BRANCH

Thursday 23 March
Branch AGM at The Institute of Energy. Nominations required for Membership of Branch Committee.
Guest speaker: Anna Walker, Director General, Energy, DTI
Contact D Barber,
tel: 01494 783142,
Email: *Rufusred@aol.com*

MIDLAND BRANCH

Friday 24 March
Race Evening at Hollyfields Centre Club
Contact Mr H Freeman,
tel: 0121 353 2397
Email: *hfreeman@talk21.com*

It is your Institute so why not get involved?

Members of the Institute responding to a recent advertisement in *Energy World*, were welcomed to the Institute's HQ on 15th December 1999 for a briefing on committee activities. The Projects and Marketing, Events Advisory and Publications Committees are all looking for new members to help take forward an ambitious programme of work outlined in the Institute's Business Plan. Thanks are extended to all those who responded and attended the meeting. Watch this space for other notices about getting involved with Institute Committees.

New Members

LONDON & HOME COUNTIES

Mr APG Bouille, Graduate
Whitby Bird & Partners
Mr GJ Colville, Graduate
(transfer). Imperial College
Mr ME Crane, MInstE (transf)
Merz Orchard Ltd
Mr MT Hanna, Associate
London Borough of Harrow
Miss J Jeyabalasingham,
Graduate. South Bank University
Miss J Lawson, Graduate
Miss A Metha, Graduate (transf)
Stratford Energy Action Centre
Mr MTL See, MInstE (transf)
Mr PG Taylor, MInstE
AEA Technology Plc

MIDLAND

Mrs KC Cooper, Associate
SERCO, RAF Cosford
Mr AD Dodwell, Associate
Barclays Bank Plc

NORTHERN IRELAND

Mr CA Brazier, Associate
Mr BNP Cochrane, AMInstE
South Eastern Education &
Library Board
Mr S Patterson, MInstE
Springvale EPS Ltd
Mr V Rasaratnam, Graduate
University of Ulster

NORTH WEST

Mr AT Kruzewski, Associate
Dalkia Energy Management Ltd

SCOTTISH

Mr MT Finucane, MInstE
WS Atkins
Mr EE Foy, Student
Heriot Watt University
Mr AW Johnstone, MInstE
Nifes Consulting Group
Mr P Miller, MInstE
Renfrewshire Council
Miss AE Nectoux, Student
Heriot Watt University
Napier University,
Academic Affiliate

SOUTH COAST

Mr G Sinfield, Associate
SMOPS HMS DRYAD

SOUTH WALES & WEST OF ENGLAND

Mr R Pearce, Student
University of Wales, Cardiff

YORKSHIRE

Mr G Cooper, Associate

Development of Institute services

In June 1999, the Council of the Institute of Energy approved a Business, Financial and Resource Plan, which outlined the strategic direction for the Institute from 2000 to 2002. In the plan, the strategic aim for membership is defined as "to encourage a lively and vigorous membership, enhancing the professional status of members and delivering desired services and benefits". Thus, in order to ascertain what the desired membership services are and to enable their delivery through the strategic plan, a questionnaire was inserted into the September 1999 issue of *Energy World*. Members were asked to tell us what they thought of the services that the Institute of Energy currently provides and to suggest possible services for future development. An encouraging number of responses were received from members across all membership grades.

The underlying trend within the responses indicates that members desire energy-related education, training, professional, business and information services. Existing publications such as *Energy World*, the Journal and the Yearbook were highly commended, as were the national and regional events and networking opportunities. In line with requests received, work has already begun in developing and running Energy Management Short Courses and Energy Recruitment/Employment Services. Information on both of these services can be found within this issue of *Energy World*. Further services to be developed for members this year include: Professional Indemnity Insurance; Regional Mentoring and CPD events and a Website Information Services. So, watch this space for further information about the development of future membership services!

Common Interest Group: working together to give members a better deal

The Institute of Energy has joined forces with representatives from the Institution of Gas Engineers, (IGE), Institution of Mining and Metallurgy (IMM), Institute of Measurement and Control (IMC), and the Chartered Institution of Building Services Engineers (CIBSE), to explore opportunities for closer collaboration. While each organisation wishes to maintain its unique identity, there are some activities that are practised on common ground. The aim of the group, with the support of the organisations' respective Governing Bodies, is to explore these activities for opportunities to work more closely, for the benefit of all members.

Senior members and staff are involved in the assessment of areas which include CPD, Publications, Events and Library & Information Services, to determine improved working methods and collaboration wherever possible. It has been agreed that InstE members will be able to access the IGE and IMM libraries as a starter for ten! Details about this new service will appear in March *Energy World*.

Deceased Members

DIXON, Richard, Fellow, Midland Branch
STANFORD, Reginald George , Member, London & Home Counties Branch

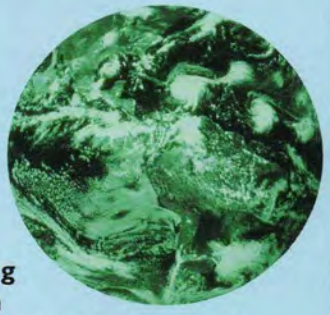
Journal of the Institute of Energy, December 1999

Contents

The Journal is available to Members of The Institute for a fee of £10 per annum or to non-members for £140 per annum

Institute of Energy Melchett Lecture 22 June 2000

Energy 21: Making The World Work



The annual Institute of Energy Melchett Lecture will take place on the evening of 22nd June 2000 in London (venue to be confirmed), following the Institute's AGM and Council.

Walt Patterson, Companion of the Institute of Energy, will be awarded the Melchett Medal 2000 by the President Richard Coldwell for his significant contribution to the energy debate. His Melchett Lecture will attempt to reassess the link between energy and human purpose - what we humans want from energy, whether we can get it and how.

Walt says "We need urgently not only to reassess but also to realign the link between energy and human purpose, to make the world work better for all of us."

To reserve your place at a Melchett Lecture fit for a new millennium see your May 2000 edition of Energy World.

SITUATIONS VACANT

Bureau Services Professional (in Energy Management)
required by TEAM
(Energy Auditing Agency Ltd).
Please contact Timothy Holman for more details. Email *Tholman@teamenergy.com* or send your CV to 34 The Forum, Rockingham Drive, Linford Wood, Milton Keynes, MK14 6LY.
Website: www.teamenergy.com.

Energy/Environmental Consultant
with 3-5 years experience required by Linden Consulting Partnership, posts are available at both the Midlands and Southern offices.
For more details contact Mrs B Gibson, Linden Consulting Partnership, East Street, Saffron Walden, Essex, CB10 1LR

Senior Engineer (Energy Management)
Calderdale Metropolitan Borough Council
Halifax - West Yorkshire
Salary: £23,895 - £26,001 pa
2 year fixed contract subject to review
Chartered Engineer/5 years experience in energy management.
Tel: 01422 392172/3 .
Closing date: 23 February 2000.

Project Development Manager/Energy Advisor, to work on the Warm Front project. The postholder will work with community organisations living in disadvantaged areas to develop self-help solutions and take action on fuel poverty and energy issues, through targeted training and support. Application form available from Ecsc, 30 Guildford Street, London, SE1 0HS (send SAE, 39p)

Experienced Energy Consultant required to manage and expand the consultancy division due to the growth of ECCL's metering division Energy Metering Technology (EMT).
The applicant should be educated to degree level and preferably have CEng status.
Experience in energy consultancy, commercial and man management skills a must.
Please send CV to Kim Potts, Energy Control Consultants Ltd, Lloyd House, 57 High Street, Burnham, Slough SL1 7JX

Please note: This space will be dedicated each month to individuals and organisations wishing to advertise situations vacant or situations wanted. Please note that this service is FREE.
For more details contact Katie Howe or Beatriz Cano on tel:020 7580 7124, fax: 020 7580 4420 or e-mail: eworld@ioe.org.uk

Your invitation to

energy policy

the driving forces of change

An opportunity for energy professionals to discuss and debate business information of the future.

- ***Are the right policy instruments in place or planned for?***
- ***Is price the consumer's only driver?***
- ***Are policy and technology working in tune?***
- ***What are the commercial implications for balancing services?***

If you have asked yourself just one of these questions in the last 12 months then this event is for you. Listen to and debate with speakers to find the answers.

Helen Liddell MP, Minister for Energy
John Chesshire, SPRU
Callum McCarthy, OFGEM
Consumer Council Representative
Market Analyst, PriceWaterhouseCoopers
Jeff Scott, National Grid & NETA working group
....together with other invited Panel guests....

Significant *Member* discounts - opportunities to profile your company - a crucial event for energy professionals to attend

Wednesday, 3 May 2000 at CBI

Centre Point 103 New Oxford Street London WC1 1DU

Contact Beatriz Cano to obtain a full brochure on
tel: 020 7580 0008, fax: 020 7580 4420, or e-mail: bcano@ioe.org.uk
and qualify for your early bird discount to attend by booking before Monday, 3 April 2000.

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