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🛞 The Royal Society

Royal Society Esso Energy Award 1997

This prestigious Award is made annually to an individual or a team, which has made an outstanding contribution or contributions to the advancement of science or engineering or technology leading to the more efficient mobilization, use or conservation of energy resources. The Award consists of a gold medal and a prize of £2000. A joint award should normally be made to not more than four people.

The 1996 Award was made to Professor T.V. Jones, Dr M.L.G. Oldfield, Dr R.W. Ainsworth and Dr P.T. Ireland for their work on studies of the heat transfer and aerodynamic characteristics of gas turbine blading.

Nomination forms are now available for the 1997 Award. For further information contact Ms Cheryl Davies, The Royal Society, 6 Carlton House Terrace, London, SW1Y 5AG Tel: (0171) 839 5561 Ext. 2579.

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COVER

Willow cuttings soaking prior to planting. Willow is one of the most suitable plants for growing on a short rotation basis as an energy crop; poplar and the perennial woody grass miscanthus are also suitable. This issue of *Energy World* contains a report from a conference on biomass organised by The Institute of Energy.

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Local energy management needs local government participation

Dr Paul Fleming

The Institute of Energy and Sustainable Development, De Monfort University

Viewpoint

Energy efficiency investment programmes from both the UK and European Union have been aimed directly at local government recently, including the EU PERU Programme and the UK Energy Saving Trust/Department of the Environment Home Energy Conservation Act (HECA) Action Programmes. These programmes have recognised the key role that local authorities have in establishing the framework for improved energy efficiency in our towns and cities. Indeed without strong local authority involvement, domestic energy efficiency measures are often not implemented.

THE HOME ENERGY CONSERVATION ACT

Energy management within UK local government has been fairly marginalised, but the Home Energy Conservation Act has helped to reduce this by putting a specific legal requirement on local authorities to identify how they can improve the energy efficiency of homes within their area. The Act has also resulted in the Government establishing a HECA Action Programme to which local authorities have been invited to bid for funding to finance energy efficiency measures. The purpose of HECA Action is to encourage local authorities to work in partnership with the private sector to deliver energy efficiency improvements across all housing tenures. The successful authorities have recently been announced (see *Energy World* December 1996, No 244). The programme was grossly oversubscribed, so demonstrating the commitment that local government has to implementing energy efficiency measures, and the 1997 call for proposals is likely to be similarly oversubscribed.

The Energy Saving Trust is increasingly working with local government to deliver some of its energy efficiency measures. When the Trust was first formed, the local authority associations argued - to no avail - for local government representation on the board of the Trust. Now, in view of the Home Energy Conservation Act there is an even greater need for local government representation. Similarly, there have been calls for more local government involvement with the day-today operation of the Trust itself.

AT THE EUROPEAN LEVEL

The European Commission has merged the PERU Programme (Regional and Urban Energy Management) into the SAVE II Programme (Specific Action for Vigorous Energy Efficiency). The PERU Programme has recently announced the creation of local and regional energy agencies in the European Union. At present, there are four agencies in the UK: Leicester; Wansbeck, Shropshire and Manchester; and there will be more once further contracts are agreed next year.

There is an annual call for such local energy agencies and the

decision on the selection of schemes is now with the SAVE II Committee. In view of the strong local government involvement in establishing agencies, the Committee of the Regions argued for local government representation on the SAVE Committee. The response for the Committee has not been positive, despite the fact that projects that have a strong local government involvement tend to be the most successful. The Commission also recognises the need for strong local political involvement with local energy agencies.

The EU programmes are particularly useful to UK authorities because they include an element of trans-national cooperation. Many UK authorities have benefited from an exchange of experience with other European municipalities who often have greater experience and expertise of energy management at a local level.

This greater knowledge and greater involvement with energy in other member states is emphasised in the amount of time the Committee of the Regions devotes to considering energy and energy efficiency issues. On the continent, many local authorities still have either direct or indirect control over local utilities and are able to use the income generated, eg from the sale of heat and electricity from municipal combined heat and power plants, to encourage local people to invest in energy efficiency measures or to reduce the deficit of public transportation systems.

THE EFFECTS OF DEREGULATION

With the deregulation of the electricity and gas industries in 1998, there is enormous potential for UK local authorities to establish municipal energy services companies with a view to generating an income which can be re-invested in energy efficiency measures.

After all, consumers do not really want cheap electricity or cheap gas, but an affordable energy service; that is affordable light, heat and power for appliances. This demands efficient, and preferable local, generation of heat and power, and efficient end-use of energy. At present, the energy market in the UK appears to be obsessed simply with cheap energy rather than affordable energy services. Local government should, together with the utilities and the Government, promote the concept of energy services.

Aside from participation in the agencies which administer funding schemes, there is another area where local government should be represented. Presently, the EU discusses energy policy with Member States and major energy suppliers, but has difficulty consulting with interest groups representing the demand (rather than supply) side interests because there is no obvious group to talk to. There is a clear need for the interests of energy demand reduction to be represented and local authorities could fill this role.



NRG Energy moves into Bolivia and Indonesia

The US based NRG Energy Inc has signed a purchase agreement with Bolivian Power Company Limited for the purchase of all outstanding common stock. Bolivian Power Company is the second largest generator of electricity in Bolivia with 153 MW of capacity, which includes 136 MW of hydro capacity and a 17 MW gas-fired peaking unit. Bolivian Power is incorporated in Canada, and maintains offices in La Paz and New York City.

Worldwide, NRG is involved in over 4,000 MW of generating capacity-in Europe, Australia, the US and Latin America.

Meanwhile NRG, together with partners Ansaldo Energia SpA, Italy; and PT Kiana Metra Tujuhdua, Indonesia; has signed a power contract with PT Perusahaan Listrik Negara (PLN), the state owned Indonesian Electric Company, to build, own and operate a 400 MW, coal-fired power station in Cilegon, West Java, Indonesia. NRG will operate and maintain the power plant for the 30 year life of the project. Construction of the new power plant is due to begin in the summer and is anticipated to be fully operational by the year 2000. Ansaldo will have responsibility for construction. The coal-fired power plant will sell its entire output to the local Jave-Bali grid.

UK electricity companies move into Turkey and the Czech Republic

National Power and two

partners have signed an agreement to finance and build a 480 MW combined cycle gas turbine (CCGT) power station in Turkey. The company is to take a one third stake for £26 million, excluding associated costs in the plant, and will also operate and maintain it. The power station will be built at Marmara Ereglisi, 100 kilometres west of Istanbul.

National Power's partners in the Marmara Ereglisi plant, with a one third share each are Marubeni Corporation, a leading Japanese trading company; and Unit Investments SA, a Luxembourg investment company.The project is owned by the JV Company, Uni-Mar.

The plant, to be built by ABB under a turnkey contract, will be similar to National Power's Deeside CCGT and is scheduled to be operational in the winter of 1998/99. It will be fuelled by natural gas supplied by Botas, the Turkish state gas supplier. Output from the station will be sold through a 20 year energy sales agreement with TEAS, the Turkish state electricity authority.

The project is National Power's fifth international deal in five months. It raises the company's total overseas investments to around £900 million in 7,500 MW of generating plant. Since June last year, National Power has also invested overseas in:

- a 36% stake in the 1,600 MW Kot Addu plant in Pakistan,
- a 100% stake in the 158 MW Milford plant in the US,
- a 70% stake in the 50 MW combined heat and power

- SJZ plant in China,
- a 52% stake in the 1,600 MW Hazelwood plant and mine in Australia.

Meanwhile, the Eastern Group has confirmed that it has acquired an 11% strategic minority interest in Severomoravska Energetika, SME, an electricity distribution company located in North Moravia, which is part of the Czech Republic near to the border with Poland and Slovakia. The purchase represents 65% of the traded equity, with the balance held principally by the State and local municipalities. SME is the largest electricity distributor in the Czech Republic serving I million customers over an area of 11,067 square kilometres. The regional economy features several major industrial companies.

The last consignment of spent nuclear fuel from Finland to Russia

The last train transporting spent nuclear fuel left Finland for Russia in December last year. This was the fifteenth and the last return consignment of nuclear waste to Russia and marks the end of one era in the Finnish nuclear industry. The last consignment included 29 tonnes of spent uranium fuel taken from the reactors of the Loviisa Power Plant in 1991.

In the period 1981 - 1996, a total of 336 tonnes of spent uranium have been returned from Loviisa to Russia. In future, Imatran Voima Oy (IVO) will dispose of the spent nuclear fuel from the Loviisa plant in Finland's bedrock together with Teollisuuden Voima Oy (Industrial Power Company).

The return transportation of spent fuel was started in 1981. Transportations have taken place once a year on an average, and a total of 2,823 fuel assemblies, or a total of 336 tonnes of uranium fuel, have been returned to Russia. With this fuel, the Loviisa Power Plant has generated a total of 85 TWh of electricity. Meanwhile, Imatran Voima's affiliate in Thailand has won an international competition for long-term electricity supplies for Electricity Generating Authority of Thailand (EGAT), Thailand's power company. The electricity will be generated at a 1,400 MW coal-fired power plant to be built to the south of Bangkok by the consortium of IVO, Union Energy of Thailand and the Japanese trading house Tomen. IVO will be responsible for operation and maintenance of the new plant.



Greenpeace delivers solar solutions on Crete



Greenpeace staff help to install solar panels at a Cretan school

One day after protests at the Heraklion power plant, Greenpeace activists have set up Greece's first grid-connected solar photovoltaic energy system at a school in Goudouras, southern Crete. Villagers, teachers and school children helped with the installation of the solar panels, delivered by the Greenpeace ship MV Arctic Sunrise. The installation is part of a campaign to halt an expansion of fossil fuel use and switch the island of Crete to solar power solutions.

Greece's first ever solar powered school is in the heart of a community that is vigorously opposing the construction of a new oil power station which would increase Crete's CO₂ emissions from the electricity sector by 50%. The island, which generates 40% of the total Greek income from the tourism sector, is already under threat from climate change. An unexpected sea level rise of 20 centimetres is threatening beaches, vital for the island's tourism and its endangered sea turtles.

"Solar power clearly works, but is being ignored by the Greek state power company" said solar campaigner Corin Millais of Greenpeace International, speaking at a hotel complex which recently installed six kilowatts of solar panels to replace an oil generator and an annual US \$ 10,000 oil bill. The owner expects to break even within 4 to 5 years.

Even the Public Power Corporation (PPC) admits that it would save over £10 million a year by abandoning the proposed power station and building a storage facility instead. Storage facilities use excess electricity to pump water uphill, so electricity can be generated through water turbines at times of high demand. This is one of four proposals suggested by Greenpeace - another includes developing two large solar power stations of 50 MW each - which would convert Crete into a fossil free, solar powered island within 6 years. But the PPC has called for "at least twenty years" of further studies, and is continuing to press for the building of the oil power station.

The Greek Governments' advisors, including the Center of Renewable Energy Sources (CRES) have concluded that "Crete is ideal for the development of renewable energies" because it has some of the highest wind and solar energy potential in the whole of Europe. Last year Greenpeace revealed that the PPC had deliberately run down one of Greece's largest wind farms on Sitia, in Crete.

Electricity use on Crete is increasing at 7% a year, double the national rate. The two existing oil fired power stations are failing to meet current power needs, especially from the tourist sector and power cuts are frequent.

Anglo-Indian oil and gas agreement

A new agreement between

the British and Indian Governments will help India's oil and gas industry to flourish. The agreement, which will ensure a closer working relationship between the DTI and the Indian Directorate General Hydrocarbons India, was signed by Energy Minister Lord Fraser and Mr A K Baalu, India's Minister of Petroleum at the Fifth International Energy Conference, Goa.

Lord Fraser said: "The agreement will enable the Directorate General Hydrocarbons to draw on the expertise and experience of the DTI's Oil and Gas Directorate to support its efforts to develop all the resources necessary for the successful sponsorship and regulation of a flourishing oil and gas industry in India. Both the British Government and the private sector are very keen to help with the challenges which the countries of Asia must meet in securing their energy needs. UK firms have enormous experience in energy project. design, construction and operation world wide. Their successes cross the oil, gas, and electricity sectors."

Under the terms of the Memorandum of Understanding, the DTI will offer advice and will provide access to UK company expertise via the OSO (Oil, Gas and Petrochemicals Supplies Office).



ABB to extend South Humber Bank power station

Newcastle based ABB Power Generation Ltd is to build a 510 MW extension to combinedcycle power plant for an independent power producer. The company has received a turnkey contract valued at over £170 million to extend the South Humber Bank power station with an additional combined-cycle plant.

The order was placed by independent power producer Humber Power Ltd, which is co-owned by several partners including ABB. Construction work at the plant, situated on the Humber River estuary south of Grimsby, will commence immediately. The plant is scheduled to be in commercial operation by the end of 1998 and will be operated by IVO Generation Services, one of the IPP partners. ABB Power Generation Ltd, based in Newcastle-upon-Tyne, will be carrying out the site work for the extension.

British Gas renegotiates contract with BP

British Gas has announced that it has renegotiated the price of some of its existing "take or pay" North Sea gas contracts, which caused the company to buy enormous quantities of gas from producers at prices well above current re-sale values. As a result of an agreement with BP, there will be lower prices on the contracts concerned. There has also been an agreement on similar principles between British Gas Trading and British Gas plc.

In addition, through the termination of other contracts with BP, British Gas will reduce the commitment to purchase gas volumes by approximately 2.8 billion therms, predominantly over the next five years. Prices on a further 13.5 billion therms phased in during the next few years will also be reduced to market levels, says British gas. British Gas Trading has agreed to pay aggregate compensation amounting to £293 million in consideration of these changes.

Commenting on the amended contracts, Roy Gardner, Executive Director, British Gas plc, said: "I am delighted that these important gas contracts have been renegotiated. These deals, taken together, represent an excellent investment. They will relieve some of our take or pay obligations and lead to reduced costs as we prepare for market liberalisation. We will also be strengthening relationships with one of our most important and valued suppliers. These renegotiations bring greater certainty to the UK gas market and we will continue to address this problem."

Chiltern Hundreds housing association wins energy efficiency award



The Chiltern Hundreds Housing Association has become the first winner of the new Housing Provider category in the East Midlands Electricity Business Energy Awards for its demonstration of a unique approach to energy-efficiency in housing at its Shenley Lodge, Milton Keynes development.

The Shenley Lodge development of 30 one- and two-bedroomed houses within the Milton Keynes Energy Park combines a highly sophisticated and environmentally friendly living space with energy efficient construction and low cost heating, at a capital expenditure of no more than for conventional housing,

A striking feature of the scheme is a glazed street, which is used to link two rows of short terraces aligned north-east/southwest across the site. The street is staggered in the middle to create a public square and has accesscontrolled entrances at each end. It is 5m wide and covered by a simple V-shaped glazed roof, provided with greenhouse type opening vents.

In winter, the vents are closed, with low level ventilation supplied at terrace gaps and at the main entrances and high level ventilation through the gap between the roof and the house eaves. In summer, the ventilation is

boosted by automatically opening the roof vents.

All the properties, which lead off the covered street, are of two storey construction and are extremely well insulated. After considering alternative forms of heating, the architects, Hutton Nichols Goodenough, opted for an all-electric solution and this was designed by East Midlands Electricity.

Space heating requirements are met by the use of a storage/fan heater, a storage heater and an optional focal point 2 kW fire in the living/dining area, panel heaters in the bedrooms and downflow fan heaters in the kitchen and bathroom. Hot water is supplied from double insulated cylinders, operating on the Heatwise Tariff.

Since completion, the housing development has more than met the original specification. The properties have achieved certification in the National Home Energy Rating (NHER) to between 9.1 and 9.9, with scores under the Government's Standard Assessment Procedure of 86 to 93.

Ocuppiers now have total energy bills of between £290 & £355 per annum.

Lord Fraser illuminates a 400 million year old record



What is 400 million

years old, 280 km long, and can be found in a former Renault garage in the leafy suburbs of one of Scotland's oldest cities? The answer is the cores and samples from every offshore oilwell drilled on the United Kingdom Continental Shelf. The Government gets a quarter of each one and keeps them in the DTI's Core Store in Edinburgh. The cores provide a unique account of how valuable oil and gas reserves have been formed over millions of years.

Access to these cores and five million cuttings samples has now been made easier with the construction of new viewing rooms, which were opened by Energy Minister Lord Fraser of Carmyllie.

"This is a remarkable archive for the UK," said Lord Fraser, "our new viewing rooms ensure that industry and academics have easier access to this unique record to help them find new reservoirs of oil and gas. It covers all offshore wells drilled since the first in 1964 in the North Sea's Southern Gas Basin. Indeed, cores from that first well, spudded on Boxing Day 1964, are here and available for inspection."

The Core Store will also hold data from the oil industry's Common Data Access initiative. This will keep a set of hard copy records from all wells drilled under petroleum production licences, so reducing the need for individual company storage facilities.

Large gas consumers face rising prices

In a sharp reversal from last year's findings, the 1996 National Utility Services International Gas Price Survey of business users shows gas prices rising in the UK.The year-on-year increase to 1st September was 5.3% - an about-turn from the 40% drop registered in the 1995 report.

Despite the climb in prices, Britain remains the cheapest for gas of the 13 countries surveyed. Prices shown in the survey are the average of independent suppliers and British Gas for contracts renewed on 1st September 1996.

"The honeymoon period that British industry has enjoyed with the injection of competition into the market is over," said Andrew Johns, NUS director, "and we have begun to see a further hardening of the market in the past couple of months. This increase is primarily due to rising spot market prices where traded gas has moved from under 10 pence to around 15 p/therm in recent weeks. Additionally, alternative suppliers, which have been severely shaving margins in a scramble for market share, are no longer prepared to trade on such small margins. It is, therefore, likely that the upward trend will continue through the present heating season."

According to NUS, the consumption of surplus North Sea gas by several sources will also keep prices at higher levels than earlier this year:

Some of this surplus gas will be used for new gas-fired power stations, which, after delays because of technical problems, will become operational this year. Even more notably, with the completion of the UK-Continental Europe gas pipeline in 1998, surplus capacity is expected to flow towards countries near Zeebrugge where the pipeline comes ashore. These countries include Belgium, the Netherlands and Germany. The electricity generators are also potential large gas

customers, given that their coal contracts expire in March 1998. As the electricity industry moves towards gas generation, these contracts are expected to be renegotiated based on a much lower level of coal usage, if the old coal-fired power stations are to be replaced by the more efficient gas-fired power stations.

The price changes registered in the survey are set in a context of confusion and discord on the issue of gas distribution. The new Network Code, which regulates the use of TransCo pipelines, has been in effect since September. Johns explained:

"This highly complex system could have significant financial impact on the market, and, especially, on small suppliers who, from now on, will need to balance their gas supply and demand on a daily basis in order to comply with the conditions of the Network Code. Although there are doubts as to whether the code will be successfully implemented, whatever the outcome, higher prices for business consumers are likely."

With the Monopolies and Mergers Commission (MMC) now investigating the dispute between TransCo and industry regulator Ofgas over TransCo's tariff structure, this long-debated argument should finally be settled. However, it is anticipated that the enquiry into whether the proposed pipeline and storage charges are in line with what is needed to give shareholders a fare return on investment could be a lengthy process.

As for the future: "What can be said with certainty is that British Gas will be taking on an entirely different role as it becomes more and more squeezed by competitive forces," concluded Johns. "Its future most likely lies with gas distribution and it must fight its cause with the MMC. It is anticipated that average gas prices for industrial and commercial users will increase."



Low income gas consumers are missing the benefits of gas competition, according to research being carried out by the Centre for Sustainable Energy and the National Right to Fuel Campaign, which shows that some companies are discriminating against low income households.

Half a million gas consumers in the South West have been able to choose a new supplier of their main gas since April year. Up to October 72,000 households had taken the option to switch.

There are 16,000 gas consumers in the trial area who pay for their gas with a prepayment meter. This meter allows consumers to pay for their gas in advance and purchase as much or as little as they can afford. It removes the possibility of the consumer running up a bill that they cannot pay. Many consumers find this is the best option if they have previously had problems paying their bills.

But the research has turned up several apparent examples of discrimination against prepayment meter users. For example, a prepayment meter consumer in Yeovil, Somerset, approached an exhibition by one of the new companies and was refused supply because she had a prepayment meter. Also, in a phone call to a new supplier to find out prepayment meter tariffs, the researcher was told that the company could not supply gas to consumers with prepayment meters. A phone call to another company provided a recommendation to contact British Gas and ask them to remove the meter before the company would be 'interested' in providing a gas supply.

Three of the new suppliers in the South West offer no discount over British Gas to prepayment meter consumers while offering 20% or more to those using monthly direct debit. Only one supplier published its prepayment meter tariff in its regular information pack. Several did not have the tariffs ready to hand on the information telephone numbers given out.

Ofgas is now investigating the situation. Ofgas has said that 12% of prepayment meter users in the trial area had switched to new suppliers, compared to around 16% overall. They claim that this figure is comparable, but the Centre for Sustainable Energy argues that the figure for prepayment meter consumers should be a lot higher.

Gas industry welcomes support for gas vehicles

The Society of British Gas

Industries has warmly welcomed the budget announcement by the Chancellor of a further 25% reduction on road fuel gases. The Chancellor also announced his intention to reduce vehicle excise duty for lorries meeting very stringent emission standards by up to £500 from early 1998. said: "The 25% reduction in duty, when tax on other road fuels is going up, should give a massive stimulus to promoting the use of gas vehicles and encourage the necessary investment in storage and refuelling facilities. The £500 reduction in vehicle excise duty on certain gas-powered goods vehicles represents a further welcome incentive to switch to gas as a clean road fuel."

Solar energy to power the schools of the future

An ambitious new scheme to install solar panels in up to 100 schools has been launched by Richard Page, the Minster with responsibility for the renewable energy. The SCOLAR programme has been given £1 million of government funding after winning a Foresight Challenge award.

Under the scheme, schools will be offered a discount of 65% to encourage them to purchase special equipment to convert solar energy into electricity. "This will allow the schools which are selected to take advantage of lower electricity bills," commented Mr Page.

"Furthermore, the equipment is being specially designed so it can be used as a teaching aid. An educational software package and Internet access will also be thrown in."

SGBI Director John Stiggers

Budget boost for Energy Saving Trust

The Energy Saving Trust has received a boost from John Gummer, the Secretary of State for the Environment, with a £21.5 million increase in funding over the next three years. The Trust's budget is to be increased in 1997/98 from a planned £15 million to £19 million, and in 1998/99 from £10 million to £13.5 million. Additionally, its funding is now to be extended to the year 1999/2000, with £14 million made available for the Trust to continue its work in bringing about market

transformation for energy efficient products and services.

Dr Eoin Lees, chief executive of the Energy Saving Trust, said: "I welcome this increase in funding, which comes against a background of considerable cutbacks for many other DoE initiatives. The increase acknowledges the progress made by the Trust and its many partners to date, and recognises our potential to achieve future breakthroughs for energy efficiency in the emerging competitive energy markets post 1998."

The UK chemical contribution to

The Dutch system of relying largely on voluntary agreements between industrial energy users and the government to meet targeted reductions in carbon emissions is much admired. Now, the UK may be heading in the same direction. This article, from ETSU, looks at the progress made to date and how it may be improved upon in the future.

The chemical industry is the largest single energy-consuming sector, accounting for around 20% of total UK industrial energy use, with annual primary energy consumption around 450 million GJ, and costs of £1.4 billion. Not surprisingly, energy reduction has been a priority for both the chemical industry and government and, as a result of good co-operation between all parties, the consumption of energy per tonne of product has been reduced by more than 60% since the 1960s.

Programmes such as the Energy Efficiency Demonstration Scheme in the 1970s and 1980s, the Energy Efficiency Best Practice programme and Making a Corporate Commitment (MACC) in the nineties have laid a solid basis for success. However, since it is estimated that there is potential for further energy and cost savings worth up to £150 million a year, neither the industry nor the Government are resting on their laurels. Joint approaches, such as 'Responsible Energy', an integral part of the industry's commitment to the health, safety and environmental programme 'Responsible Care', ensure that commitment remains high. Responsible Energy is run by the Chemicals Industry Association (CIA), which represents 176 chemical companies which between them account for around 80% of the industry's primary energy consumption, in collaboration with the Institution of Chemical Engineers and the Department of the Environment.



Existing initiatives encourage individual companies to develop corporate policies on energy performance, including the setting of definite targets to reduce consumption; the effectiveness of these initiatives can easily be seen, as MACC signatories now account for around fifty percent of industry energy usage. Future programmes to reduce the emission of greenhouse gases and cut energy consumption may include 'negotiated agreements' between the chemical industry and Government. The CIA has already expressed its support for a pilot study with the DoE and ETSU, with key features likely to include the setting of realistic energy savings targets by industry and appropriate support measures provided by the Government. In order to provide further support for all future initiatives, ETSU has announced a programme to guarantee easier access for companies to its library of more than 1,300 energy efficiency publications.

The development of a 'Responsible Energy Matrix' for the chemical industry will

provide a major field for future co-operation between the chemical industry and government. The original 'Energy Management Matrix' provided a simple, but effective, diagnostic tool to enable companies to evaluate their energy performance in six key areas - policy, organisational structure, staff motivation, information systems, marketing and investment. Since 1993, the matrix has been used by over 2,000 organisations and has been a key factor in helping the UK reduce both energy consumption and harmful emissions. Now, the CIA is working with the DoE on a new, industry-specific matrix which will be tailored to the needs of both large and small chemical sites.

Success stories in reducing energy consumption can be found throughout the industry.

Hampshire Chemicals, which employs around 50 staff at their Seal Sands plant, introduced an 'Energy Improvement Programme' in 1992 with the aim of reducing

industry's energy efficiency

electricity, fuel oil and water consumption. A 'Good Housekeeping' campaign, involving the participation and commitment of staff at all levels, saved the Company more than £250,000 over a five-year period, a success which has prompted Hampshire Chemicals to sign up to the MACC.

On a larger scale, BP Chemicals has reduced energy consumption by 8%, worth £2 million a year, by improving energy management information systems at its chemicals manufacturing complex in Hull. The site has energy costs of around £34 million per year and, in order to improve process efficiency, BP introduced a 'Utilities Control System' (UCS) in 1990. The system gives measurements of process steam, gas and electricity consumption, collects and stores data, provides a site communications network, and incorporates a management information system and modelling software. UCS provides the vital data needed to allow informed decisions on improving performance, and its flexibility means that it can be used by staff at all levels. The system enables senior management to track performance and set targets for improvements; technicians to improve their understanding of daily activities and, therefore, use utilities more efficiently; and, finally, engineers to analyse problems and to identify opportunities to implement improvements.

At the time of installation, capital costs were fairly high at around £5 million, even so, payback was achieved in two and half years. Today, however, the capital cost would be lower, as developments in information technology have led to significant cost reductions in both hardware and software.

In addition to controlling utilities, BP's strategy covers five other information areas, all of which have contributed to major improvements in site process performance. BP's programme is a model for the industry,

Energy Management Matrix

Level	Energy Policy	Organising	Motivation	Information Systems	Marketing	Investment
4	Active commitment of top management	Fully integrated into general management	All staff accept responsibility for saving energy	Comprehensive system with effective management reporting	Extensive marketing within and outside organisation	Positive discrimination in favour of 'green' schemes
3	Formal policy but no commitment from top	Clear delegation and accountability	Most major users motivated to save energy	Monthly monitoring and targeting for individual premises	Regular publicity campaigns	Same appraisal criteria used as for all other investment
2	Unadopted policy	Delegation but line management and authority unclear	Motivation patchy or sporadic	Monthly monitoring and targeting by fuel type	Some adhoc staff awareness training	Investment with short term payback only
1	Unwritten set of guidelines	Informal part-time responsibility	Some staff awareness of importance of energy saving	Invoice checking	Informal contacts used to promote energy efficiency	Only low cost measures taken
0	No explicit policy	No delegation of energy management	No awareness of the need to save energy	No information system or accounting for consumption	No marketing or promotion	No investment in energy efficiency

and information on this project gathered by independent consultants is available to show how a similar energy management information system could be cost-effectively implemented by other companies.

FURTHER INFORMATION:

Energy Management Matrix - see Good Practice Guide 167, Hampshire Chemicals Energy Improvement Programme - see Good Practice Case Study 265, BP Chemicals - see Good Practice Case Study 330. Copies of all these publications and are available from the Energy Efficiency Enquiries Bureau, ETSU, Harwell, Didcot, Oxfordshire OX11 0RA.Tel: 01235 436747. Fax: 01235 433066. etsu.enq@aeat.co.uk. Internet: http://www.etsu.com/eebpp.There is also an Energy Helpline (0541 542541) which offers free advice on energy efficiency to UK companies.

CHP cuts bills Gas turbine-based CHP plant is gradually replacing much of the UK's existing CHP capacity - much of this based on coal and steam turbines. Total UK CHP reportive in close requires totality. The

replacing much of the UK's existing CHP capacity - much of this based on coal and steam turbines. Total UK CHP capacity is also growing steadily. The availability of 'no-capital' energy services contracts has helped many industrial sites to benefit from CHP without financing its installation - Zeneca Huddersfield is one successful example.

The amount of CHP in use in the UK has risen to 3,700 MWe, with an estimated further 200 MWe under construction. It has increased by more than half since electricity privatisation in 1990 and now generates more than 5% of the total electricity used the UK, according to the latest DTI statistics.

CHP is thus broadly on-course to meet the Government's target, established as part of its response to the prospect of global climate change, for 5,000 MW by the year 2000. The latest DoE estimates suggest an "economic potential" for CHP of 12,000 MWe.

The vast majority of installed CHP capacity is contained in large-scale, tailor-built plants installed at industrial sites, a sector in which CHP is booming. In recent years, nearly all such plants have been installed under one of a range of energy services arrangements, under which a third party CHP supplier or energy services company builds the plant at the host's site at no capital cost to the host who agrees to buy some or all of its output for a period of, typically, ten years.

The host company is relieved from having to finance the plant, yet still buys energy more cheaply than it did previously, in effect sharing the energy cost savings generated by the new plant with the energy services company.

One successful example of this approach to CHP is the plant installed by AHS Emstar at Zeneca Fine Chemicals' 250 acre manufacturing site in Huddersfield. Built and now operated for Zeneca under a 15-year energy services agreement by AHS Emstar, the 16 MW plant is said to be achieving an



average operating efficiency of around 85% slightly exceeding initial forecasts. The plant, which replaced coal-fired boilers, was opened last October.

Zeneca, which de-merged from ICI in 1993, is a leading international biosciencebased company manufacturing and marketing pharmaceuticals, agrochemicals, seeds and speciality chemicals. The Huddersfield site, the company's largest manufacturing facility and the size of a small town, is involved in the manufacture of both intermediates and final products. Steam and electricity form the lifeblood of the whole site.

The partnership between the companies began in 1994 when they first signed the £45 million agreement which is now saving Zeneca in the region of £2.5 million a year in reduced energy costs. The initiative was driven by new HMIP regulations and high energy costs, particularly for imported power, which meant that the site's energy plant needed a major capital injection to bring it up to date and up to standard. Zeneca examined the economics of a full refurbishment of existing plant (some of which dated back to the 1940s), a new coal-fired plant and CHP based on gas turbines. This last option was selected, along with the full contracting-out of building and operating the new plant. AHS Emstar was awarded a similar contract for Zeneca's Grangemouth site in 1994.

The new contract at Huddersfield involved the design, construction, commissioning and subsequent operation and maintenance of a new energy plant. This comprises a 6.2 MW gas turbine, a 60 tonnes/hour waste heat boiler, a 29 tonnes/hour package boiler and a water treatment plant, alongside two existing steam turbines which have been relocated to provide a total CHP capacity of 16 MW.

An existing 50 tonne per hour coal-fired boiler has been retained and works in conjunction with the new plant. A new 'powerhouse' has been built to accommodate all new plant, including a high technology monitoring and control system. The whole project was carried out without

and for Zeneca

any production losses to Zeneca.

Under the energy services agreement, AHS Emstar is responsible for operating and maintaining the plant to supply all the steam and electricity to the site. AHS is paid a fixed annual standing charge and incentive payments according the efficiency of operation. The agreement also includes full warranty of the CHP plant over the 15 year contract period, including liability for liquidated damages for energy supply interruptions.

The new plant complies with all Environment Agency requirements and has significantly reduced emissions of carbon dioxide, sulphur dioxide, oxides of nitrogen and particulates to the atmosphere. The site now uses gas and coal as its primary fuels to provide the most economical conversion to steam and electricity, with gas oil available as a stand-by fuel in place of gas.

The sophisticated diagnostic and reporting systems provide management information direct from the plant, giving Zeneca a monthly analysis of efficiencies. They also act as early warning and diagnostic systems, alerting AHS Emstar's engineers to potential faults.

The site is staffed by a team of 23 AHS Emstar people who provide a 24 hour a day, 365 days a year cover. They work in partnership with Zeneca production managers, adjusting the amount of steam and electricity generated to match production schedules.

Apart from the increase in site energy efficiency, reduced energy bills and environmental emissions, the CHP plant and energy services contract also provides, according to Zeneca's Head of Services and Utilities Pat Lundy: "the peace of mind of having a single point of contact for all our energy requirements - this allows us to concentrate on our core business of the manufacture of fine organic chemicals and pharmaceuticals".



ZENECA HUDDERSFIELD EQUIPMENT COMPONENTS

Lubrizol contracts out energy services

Outsourcing site energy services is an increasingly popular option for large industrial plants. BP Energy is one of the big players here the company outlines its activities at the chemicals specialist the Lubrizol Corporation.

The Lubrizol Corporation's Bromborough site on the Wirral has become the first of 17 world-wide Lubrizol plants to contract out its energy and other utilities services. These wide-ranging services are the responsibility of BP Energy Limited under an £8 million, ten-year performance related outsourcing contract.

Lubrizol is a leading manufacturer of speciality additives for lubricating oils used in petrol and diesel engines, automatic transmissions, gear drives, marine engines and tractors. The Corporation, with headquarters at Cleveland, Ohio, has more than 4,500 employees.

The Bromborough site, with a total energy bill of around ± 1.4 million a year, is a key exporter - with 65% of production for customers in the European Union and other

Scandinavian countries. Lubrizol already actively managed its energy systems and use, so short-term cost savings were not the only driver for outsourcing. Lubrizol focused, according to BP Energy, on a wider set of objectives:

- freeing resources to concentrate on its core business of speciality chemicals,
- accessing external utilities management expertise with a partner sharing the Corporation's commitment to consistently high standards of quality and safety,
- choosing a partner with a track record of experience, capable of managing all utilities on site - including boiler plant, energy recovery and effluent management,
- securing a long-term, open partnership,
- assisting the Corporation to manage change on site, sensitively and without disruption,
- achieving continuous improvement working hard to drive down costs on site by identifying and implementing cost-saving projects throughout the ten year agreement.



Initial discussions between the parties resulted in agreement of the principles of mutual benefit and continuous improvement. Detailed negotiations enabled Lubrizol to satisfy itself that BP Energy was the preferred partner. BP Energy claims to be the UK's leading industrial utilities management company, operating under contract more process boiler capacity than any other company in a range of industries including chemicals.

Under the 10 year performance agreement BP Energy is responsible for:

- operation and maintenance of steam boiler plant, energy recovery plant, filter cake handling unit, waste water management unit, nitrogen generation plant, cooling water system and compressor plant,
- supply of steam for process plant and all site uses,
- underwriting key performance criteria,
- continuous improvement plans, including a site utilities' survey and implementing cost saving proposals,

* environmental monitoring and control. BP Energy has a site-based team managing the utility services around-the-clock, 365 days a year, with back up from the regional business team including specialist energy and environmental engineers.

BP Energy's track record in the chemicals industry includes a long-standing agreement with Solvay-Interox - the major international chemicals group based in Belgium - to operate and maintain the utilities' plant at the Warrington, Cheshire, works.

Lubrizol Corporation, founded in 1928, operates manufacturing and blending facilities, laboratories and has offices around the world. In addition to being the recognised leader in speciality additive system for lubricating oils, the company also supplies speciality products for industrial fluids, fuel additives, process chemicals and coating additives. It also develops performance chemicals for specialised markets.

Cutting energy costs with electricity



The Electricity Association's Business Energy Awards are an annual celebration of the use of high efficiency electric systems in business. This year, industrial users won many of the Awards.

THREAD-MAKER CUTS BILLS BY 57%

Lancashire-based A L Paul & Co Ltd, a manufacturer of dyed sewing threads, won the award for companies with fewer than 150 employees for a new infra-red product drying technique.

Traditionally, thread was wound on to a former and placed in a pressurised dyeing vessel at up to 130°C for up to 14 hours. It was then centrifuged to remove excess moisture, oven dried for 24 hours and wound on to a cone to be steamed for 30 minutes to smooth out the surface. A lubricant was then applied cold and the thread dried again.

Trials at NORWEB'S EMTEC Centre found infra-red heat to be ideal for drying and a complete continuous process was then developed for dyeing, drying and winding.

Threads now pass through a bank of infra-red emitters and a high temperature oven, to bake on the dye, followed by a lubricant bath and a final bank of infra-red emitters. The process, previously dispersed, is now condensed into one area. A 200 kg batch can be produced in only eight hours instead of the three days previously. Energy costs are said to be down by 57% and there is also a saving on chemicals and

dye stuffs. In the same

category, the Speyside Cooperage Company was highly commended for its use of radio

frequency heating and infra-red 'toasting' of oak casks for whisky, while Simbec Research was commended for using electric heat pumps and invertor controls on heating equipment.

RAILWAY LINE FASTENERS BENEFIT FROM ELECTRIC HEATING

Pandrol UK Ltd of Worksop,

Nottinghamshire won the award for larger industrial companies for introducing new induction heating and infra-red curing techniques into its manufacture of fastenings for fixing railway lines to sleepers.

Pandrol exports 80% of its fastenings and so keeps a close watch on relevant overseas legislation and standards. As an example, new legislation in Scandinavia has meant that the

bitumastic coating used on the product is no longer acceptable, giving Pandrol the task of finding a solvent-free process. Second, the company identified a potential market in Japan worth £3 million a year, but this depended on meeting a very specific metallurgical quality standard.

Components are forged from steel bar heated to 1000°C. Japanese standards require strict control over decarburisation, which weakens the product depending on its temperature conditioning. The existing conveyor gas furnace took 18-19 minutes to heat the product, something which had to be reduced to seconds.

Consultation with East Midlands Electricity identified electromagnetic induction heating as a solution and the new induction coil fitted at the plant, rated at 350 kW, can heat I kg of steel bar in 12 seconds. An automatic heat sensor can identify and reject a single bar if the temperature is incorrect.

A new coating process was also devised, using powder coating applied electrostatically to components on a mesh belt conveyor. The coating is cured using infra-red heaters and hot air. On leaving the curing oven, the product is water cooled and then dried using an air knife, before being weighed and bagged.

The company's investment has been rewarded by winning the contract to supply the whole Eastern Japanese Railroad system while the Scandinavian business, worth £6 million a year, has been retained.

Office equipment manufacturer Herman Miller Ltd was highly commended for its installation of an automated production line incorporating hot air and ultra-violet curing.



Renewing the geopolitics

by John V Mitchell

Based on The New Geopolitics of Energy by John V Mitchell with Peter Beck and Michael Grubb and published by the Institute of International Affairs in London, this article takes a fresh look at the geopolitical background to today's energy issues. It concludes that recent changes in Russia, China and the Middle East, together with liberalisation and globalisation of the energy industries around the world have rendered the old models obsolete.

he geopolitics of energy are getting interesting again. This is not because some great event is pushing energy up the international political agenda - climate change may do that eventually - but because so much has changed in energy, and in the world of international politics. Geographical changes continue, dividing energy exporters from importers, but the energy industries and their politics are a few pebbles in a river of change. They are swept along by the demotion of one superpower, by the emergence of a new global economy incorporating the formerly centrally planned economies, by the demand growth engines of Asia, by the withdrawal of governments from economic micro-management almost everywhere, and by the overwhelming force of information-led technology.

OIL SUPPLY

Technology, liberalisation, and globalisation have all contributed to striking changes in the oil stream, which formerly entrained so much of the 'old geopolitics'. For thirty years, regardless of pessimistic forecasts, and apparently almost independent of huge changes in oil prices and industrial structure, oil production has grown steadily year after almost every year, by about 600,000 bd, in that part of the world which is neither in OPEC nor the Former Soviet Union. This has been the most stable trend of all in the geopolitically defined world of oil, as the graph shows.

If we project this trend for ten or fifteen years, make quite modest assumptions about continuing growth in OPEC outside the Middle East (mainly in Venezuela) and a return to growth in the Former Soviet Union after 2000 (mainly in the Caspian region, but also in the swathe of proved but undeveloped reserves in Russia), it is very easy to come to a conclusion in which the Middle East share of world oil production to 2010 will remain where it is: close to 30% for demand forecasts in the range of 85-90 mmbd. It may rise slowly towards 40% only for a combination of demand in the range 97-100 mmbd and static production everywhere else - an unlikely combination. There is no medium term prospect that the Middle East will supply the greater part of the world's oil. Realising this is the first step

in refocussing the role of the Middle East in the geopolitics of oil.

Against this assertion - optimistic for consumers, pessimistic for producers - there is an argument that discovery rates worldwide are falling fast, and large mature fields are depleting, so that production outside the Middle East will begin to fall soon after the year 2000 and prices will then rise and keep rising . The argument is set out by C | Campbell and others using recent work by Petroconsultants Ltd. This is the same argument that was made by some geologists a quarter of a century ago and was included in the famous Club of Rome modelling exercises. These depletion arguments are no better guides to policy for the next ten or fifteen years than they were for the last twenty five years. There are several reasons for this, mainly to do with economics:

 First, before reserves become a binding constraint on production there is a strong incentive to expand production.
When the constraint begins to approach, there is a strong incentive to expand recoverable reserves either by



of energy

exploring new areas (as in Latin America today) or by increasing recovery rates (as in the North Sea today). These incentives work so long as new areas are available on commercial terms and technology is developing. For the world outside the Middle East there is no sign that either trend is likely to fade within the next fifteen years. Moreover, the technology which is enabling increased recovery in the North Sea has only just begun to be applied in the state oil producing sectors such as Mexico, Brazil, China, and Venezuela and in Russia, let alone in countries such as Iraq or Iran in the Middle East itself.

- Second, although the geography of reserves will assert itself as we move further into the next century, it will do so in an energy market where demand for fossil fuels will probably be increasingly constrained by climate change policies. Natural gas and renewable energies will be helped by governments to take market share from oil for this and other environmental reasons, and the steady expansion of the production base of liquid fuels from Venezuelan and Canadian (and perhaps other) heavy oil and tar sand deposits will count in the world balance.
- Third, the producers in the Middle East have very strong reasons to continue to expand production and to compete for markets and revenues. The major exporters are differently endowed with oil reserves and differently burdened with the revenue needs of expanding populations and undiversified economies.

As demand for Middle East oil increases there is a clear division between countries which can gain extra revenue through increasing production (Saudi Arabia and Iraq) and those who can gain it mainly though higher prices. "Managing" a cartel among these producers in a period of rising demand may be more difficult than managing a cartel in the face of falling demand, as OPEC has found since 1986.

MIDDLE EAST

To the commercial difficulties of creating a Middle East oil cartel one has to add much wider geopolitical ingredients. The countries concerned are rivals on at least three other dimensions. First: ideologically, between traditionalist Islam, radical Islam, and secular trends (none of them simple to define). Second: regionally, in the raw competition for power which has been demonstrated by Iraq in attacking two of its neighbours, by Iran in its activities in the Gulf from time to time and by Saudi Arabia in its use of funds to promote its interests outside its borders. Third: internationally, the problems of Palestine and Israel draw all the oil exporters into a much large arena through their contributions negative or positive, to the peace process to which the world's remaining superpower (and many other countries) attach great importance. This international dimension feeds back into the commercial picture. The degree of discord between Iraq or Iran on the one hand and the US (with or without the UN and allies) on the other, is such that both countries are severely constrained from expanding production because of embargoes on markets and on investment and the transfer of technology. The division of interest between

them and Saudi Arabia in the price-versus volume trade-off is thus even more acute.

Stability, in all this, depends on the continuing US military protection of the Gulf and the memory of US and allied intervention in 1991. These in turn depend at least partly on the continuing effective compromise within Saudi Arabia between traditionalist Islamic objectives and the objective of secular co-operation with the US and its allies to secure military protection, arms, and technology. With Saudi Arabia, Kuwait and Abu Dhabi probably the only countries in the Middle East likely to see any growth in GDP per capita during the next five years, this compromise is for the Saudi rulers, and those who depend on their co-operation, a high-wire act in a rising wind.

The risk of permanent oil price increases engineered by a cartel of Middle East exporters is therefore remote: they will not have market power in the next 10-15 years or more even if they act together and this they are very unlikely to do - for geopolitical reasons.

One element of the traditional energy security analysis remains: the risk of disruption caused by political instability. It is controlled only by the strength of the US positive relationship with Saudi Arabia and the negative relationship between the US and Iraq and Iran. The policy message is clear: prepare to mitigate disruptions, hedge any bets on permanently higher oil prices.

RUSSIA

After refocussing the Middle East, the next feature to be included in the "New Geopolitics" is obviously Russia and the Caspian states of the Former Soviet Union. Russia, with 85% of the petroleum resources of the former Soviet union and about 20% of the world's known and likely petroleum resources is clearly a Petroleum Superpower - the more powerful because (unlike Saudi Arabia) its exports, though large, are additional to a larger domestic market and because its export revenues, though important, are not the basis of the whole economy or of its ability to project military power beyond its borders.

The amazing changes of the past six of seven years in Russia - territorial, constitutional, political, economic and ideological - can be interpreted as a "glass half-full or half empty" of transformation to a market-based, democratic, civil society. The petroleum sector cannot move much faster than the rest of the economy and society: each step requires an exhausting and apparently indeterminable Cossack dance of conflicting signals. Russia is not a country in which foreign companies can establish an enclave within which to carry out "normal" projects regardless of what happens in the country and economy at large. However, certain things seem clear:

- The oil industry will remain decentralised and privatised: its companies will compete with each other, raise capital, invest and do business outside Russia with or without foreign partners.
- There will be a number of giant projects, in which some kind of productionsharing terms will apply and in which major foreign companies will be involved. The projects in the Caspian non-Russian states are rather special cases of these, involving state companies, rather than "privatised" companies as partners, and perhaps enjoying more "enclave" status than the projects in Russia itself. Caspian developments are inextricably linked up with Russia's political interests in the area.
- Gas and Gazprom is a different game. Gazprom produces more hydrocarbons than Saudi-Aramco. It has a monopoly of the Russian gas distribution system It supplies 13% of all Western European petroleum imports from the rest of the

world (The Russian oil companies supply another 14%). Gazprom's future role in Russia and Europe cannot be a simple commercial one.

EAST ASIA

The next great geopolitical theatre in which energy plays a role is East Asia. East Asia now consumes as much energy as the United States and, if Japan is not counted, more energy than the European Union. East Asian energy consumption is expanding at twice the OECD rate. There are open and deregulated markets only in a few countries - mainly for petroleum - though there is a trend towards deregulation (in Japan particularly) and towards more marketrelated pricing and incentives in other countries. Government energy policy (and pricing policy within general economic policy) therefore still plays a role in many of these countries. This is of particular importance in the choice of fuel for power generation.

The fuel mix in East Asian countries varies greatly under the influence of local resources. Three quarters of China's energy comes from Chinese coal; over 80% of the energy used in Indonesia and the Philippines comes from local oil and gas. Among the countries mainly dependent on energy imports, Japan, Korea and Taiwan have diversified their mix with nuclear developments and imported LNG, but the share of gas in their energy markets is lower than in Europe. For the South East Asian importers oil is the principal source of fuel. As demand increases. China and the importing countries will look to increasing petroleum imports.

A major question is the role of gas in this increasing demand. Regional resources will be inadequate to support even the growth of Japanese gas demand, let alone demand from other Asian countries. Further investments in Gulf LNG exports (as from Qatar) may be the beginning of a trend which will bind the Asian countries ever more closely to the Gulf petroleum exporters. There are additional options: pipeline gas from eastern Russia to China and Korea could serve many purposes: commercial, political and environmental. To

prove the reserves, develop the supplies, and secure investment in the necessary pipelines would be a major challenge to these countries' ability to co-operate for a common economic objective. Such projects have to take their chance in a local geopolitical context complicated by border disputes, disputes arising from the ending of World War 2, and above all by differing international relationships. Japan and Korea have treaty-based US military protection; relationships between the US and China are complicated by human rights and democracy issues which the US Congress is apt to put into legislation binding the Administration's freedom of foreign policy action.

THE US ROLE

The US has a role in all the regional geopolitical issues so far discussed: in the promoting and supporting of private sector investment; in securing the stability (of a particular kind) of the Gulf; in its support, through international agencies as well as bilaterally, for economic reform in Russia and the other former CIS states; in its interventions against Iran in the Caspian; in its military role in East Asia and in its relationships with China - the "defining theme" according to President Clinton - of foreign policy in his second term. The US is also critical to the two remaining geopolitical issues which are high on the agenda today and which are not regionally defined: nuclear energy and global climate policy.

NUCLEAR ENERGY

Nuclear energy has turned from being a focus of hope to a focus of fear. New nuclear building in the US and Europe (outside France and Eastern Europe) has virtually ceased. The problem of finding sites acceptable to local communities has become severe, even in countries like Japan where the central government remains committed to nuclear energy. Nuclear development in the third world runs straight into geopolitical roadblocks because of US concern about the development of technology and the accumulation of spent fuels which could allow the proliferation of weapons of mass destruction. This is a major point in the UN sanctions against Iraq and the US policy

towards Iran. It became a dangerous element in Asia when it seemed that North Korea was set on a programme unacceptable to the US. Meanwhile, the nuclear construction industry is deterred from undertaking the research and development which might lead to a generation of reactor designs which the public in the future might accept as safe. For the moment, nuclear energy options which might be significant in global terms do not exist.

CLIMATE CHANGE

The suppression of global nuclear energy options presents a particular difficulty in another emerging geopolitical arena: that of climate change policy. The scientific understanding of global warming and related climate change is progressing to the point where there a widening mismatch between what appears to b the problem and what appear to be the solutions offered by the current commitments. A cumbersome international negotiation process is grinding towards some set of policies which will increasingly constrain the emission of greenhouse gases and therefore inevitably the use of fossil fuels. This is happening first in the so called "Annex I" countries of the Framework Convention on Climate Change and later - on terms which are by no means clear and to which there are no commitments at present - in some of the developing countries which will in future be the major contributors to the growth of atmospheric concentrations of greenhouse gases.

The United States in 1996 has committed itself to work towards legally binding international commitments on greenhouse gas emission control, albeit with maximum flexibility as to detail and with a focus of the "medium" term rather than the next five years. Concern about the climate fits into a larger concern, driven by increasing numbers of people and their growing prosperity, about "sustainability". This applies to a very wide range of environmental features- global and regional climate, wetlands, ocean habitants, forests and the like - which spill over national boundaries and whose politics also cross frontiers.

SUMMARY

To sum up, there is a "new geopolitics" of energy, It is part of a much wider geopolitical agenda: liberalisation and globalisation of the world economy; rivalry between Middle Eastern countries and differences in their relations with the rest of the world; the emergence of a democratic Russia as an important part of the global market economy; the rise of Asia as a region of geopolitical tensions and the definition of China's place in that region; the global future of nuclear energy and the slow commitment of major governments to protect the climate against changes which may be induced by fossil fuel consumption. In every case, it is possible, though difficult, to relate these issues to practical business issues, though not with any degree of certainty or precision. Welcome to complexity!

The New Geopolitics of Energy, by John V Mitchell with Peter Beck and Michael Grubb, is published by the Institute of International Affairs, London, £14.95.

Renewable Energy

Renewables - a major contribution?

By Geoff Loram

Part two of Geoff Loram's report from an IBC conference held on renewable energy in London in November. Part one covered policy and planning matters, this month Geoff reports on wind, wastes and solar energy.

WIND ENERGY

For those studying wind energy the three papers from Germany, Denmark and the UK - representing the bulk of wind energy production in Europe - provided a fund of information about the history, development, present usage and future prospects.

The Danish story was told by Soren Krohn, managing director of the Danish Wind Turbine Manufacturers Association, starting with some interesting early history the first large scale experiments were made in 1890. Nothing much happened for 60 years but in the 1950s trials were begun which resulted in the first connection of a turbine to the grid and in 1956 a 200 kW machine was commissioned which ran without maintenance for 11 years. Increasing interest in the 1970s was spurred on by the increase in energy prices and the distrust of the Danish population of nuclear power. Capital grants were made available but gradually reduced and phased out altogether in 1989; currently wind energy is supported by being able to reclaim the CO2 tax that is levied on all electricity; the utility companies are also required to buy all wind generated power offered to them at 85% of the retail market price. Two thirds of the 4,000

turbines in Denmark are owned by wind energy co-operatives or individual farmers and wind energy supplies 4.5% of Danish electricity consumption with a target of 10% by 2005 and up to 30-50% by 2030.

Although two experimental 630 kW turbines were built in the early 1980s they were not a commercial success but the smaller machines were proven enough to be able to cash in on what Mr Krohn calls the California wind rush. State support resulted in a surge of wind farm installation in California and the Danes had more experience than most in meeting the demand; this gave considerable impetus to the development of cheaper and more efficient turbines. The downside was that it was a single market and when it dried up a large number of the 20odd manufacturers went bankrupt; the UK company Howden also supplied a number of turbines but later pulled out of the market.

The German view was presented by Dr Thyge Weller of the German Wind Energy Association. Dr Weller noted that Germans in general have a strong environmental

attitude and are willing to invest (at least moderately) in a clean environment. Also, from a resource point of view, Germany has a lot of coal mines which need

enormous subsidies to sell their expensive products, but no oil, no gas and very limited and already exploited hydro resources.

The pressure for a self-supporting German economy in the 1940s led to design work being done on very large wind generators which, although they never left the drawing board, influenced the next phase of German wind power development spurred on by the Club of Rome report and the first oil crisis in 1973. The government set up a research programme for a 3 MW turbine. Dr Weller says "This 100 m giant faced severe technological problems and was operational just about 500 hours. It failed due to an unmanageable approach (everything in one step), half-hearted political support, resistance of utilities and the absence of interest from Germany's hi-tech industry." However, whilst this was going on a number of private individuals were developing small wind turbines and, after their fair share of trouble, finally produced some reasonably efficient and robust turbines. This success persuaded the research ministry that the gradual improvement of small systems was a better way forward.

Eventually in 1988 the ministry of research set up a programme to encourage the installation of 100 MW of wind power which was increased to 250 MW the following year and covered the now re-unified eastern Lander: There were two alternative subsidies offered; either an investment subsidy based on the hub height and rotor diameter - to a maximum of 90,000 DM - plus 60% of total erection costs, or operation subsidies of 0.06 DM/kWh (2.4p/kWh). With subsidies like those it is not surprising that the utilities were unhappy and uncooperative, so much so that

a law was introduced in 1991 requiring them to buy the wind power at a minimum of 90% of their average electricity rate which is, today, about 0.17 DM/kWh (6.8p/kWh). There are also sometimes further subsidies available from the EU and even local district sources

"This 100 m giant faced severe technological problems"

and as a result there were in June '96 3,846 turbines in operation with an overall capacity of 1,284 MW. The bulk of this

capacity is concentrated in the coastal north-west of

the country but Dr Weller reports that site costs are rising steeply there and more turbines are now being installed inland using higher towers and increased rotor diameters. It is clear from Dr Weller's paper that political pressure is the mainspring of German wind energy; this seems to stem from a combination of an environmentally conscious society and an electoral system that leads all the political parties to be as 'green' as the Green Party to prevent the latter from gaining too many seats in the Bundestag and upsetting the coalition balances.

The paper presented by Dr Ian Mays, managing director of Renewable Energy Systems Ltd, was a wide ranging global review of the progress of wind energy and an attempt to chart a way forward. On the global scale he gave figures, as at the beginning of this year, showing that the world

wind energy capacity amounted to 4,720 MW with 2.420 MW located in Europe, 1,700 MW in the US, 500 MW in India and 100 MW in other countries. It was

estimated that Europe's share would produce about 4.5 TWh of electrical power each year which is sufficient to meet the needs of 4 million people and to save the emission of almost 5 million tonnes of carbon dioxide. Dr Mays saw excellent prospects for the wind power industry with rapidly developing markets in India, where they were manufacturing turbines themselves, and

China. Other new markets such as South America and Australasia were starting to emerge and overall about 1,000 MW were being installed each year. The technology was now reaching maturity with the current favoured size being 600 MW, he thought that might go up to 1-1.5 MW but that the latter was about the economic limit. Machines were now extremely reliable with availabilities of 98-99% - that is when the wind is blowing strongly enough and not too strongly.

WASTES

Will fluidised bed EfW

plants that are

successful in NFFO-4

show higher efficiencies

and better economics

than mass-burn

incinerators?

Peter Gerstrom of South East London Combined Heat and Power (SELCHP) explored the backdrop to the current framework which enables energy-fromwaste (EfW) schemes to be implemented as the "best practicable environment option" for municipal solid waste. He also looked at some of the hurdles that remain and threats that linger. Since SELCHP is the only EfW plant to be completed since the 1970s, though others are following, it is natural that it is used to illustrate some points.

Mr Gerstrom rightly stressed the need to extract the maximum amount of energy from a tonne of waste, speaking of generating more than 500 kW/tonne; while also stating that an electricity-only scheme will yield 22% overall efficiency. If we allow, say, 0.53 MW per tonne, that the net cv of the refuse is 8.7 GJ/tonne, which is lower than it is generally reckoned to

> be these days. Good combustion and boiler efficiencies ought to yield better than 0.7 MW/tonne which would give a 33% increase in income; the question is how to achieve those higher efficiencies.

The low efficiencies at SELCHP reflect the fact that the grate and furnace design has changed little in the past 30 years and, because massburn incinerators have been mainly regarded as a waste disposal method and not as a competitive method of generating electricity, there has been little pressure for increased efficiency. One of the major causes of low efficiency is the large quantity of excess air

employed, this has to be heated, in effect, to the flue gas temperature and that heat is lost up the stack. Work was done in the mid-1980s in Germany on using optical pyrometers to improve the control of the air supply and achieved considerable success; the idea seemed to be slow to catch on but recent mass-burn plants designed and built by NOELL in Germany have incorporated such a system.

It will be interesting to see if any fluidised bed EfW plants that are successful in NFFO 4 show higher efficiencies and better economics than mass-burn incinerators, they certainly ought to as their boiler efficiency is around 85% compared with 75% or less for a mass-burn plant. It will be pointed out that fluidised bed boilers will require the waste to be shredded before burning - though that is not true of all designs - and the power consumed will need to set against any gains in efficiency; but the crucial figure is the number of kilowatts exported per tonne of waste burned which takes account of the size of the parasitic load. But parasitic load will be affected by many factors, for instance, a fluidised bed plant ought to be using a more efficient waste reception and feed system than the bunker and overhead grab cranes used for mass-burn plants.

Mr Gerstrom included an interesting section on the CHP part of SELCHP which they hope to install in the future. An important feature which he described in his presentation is the use of an accumulator, a very large fully insulated hot water tank. This is charged with hot water at maximum temperature during the night when demand for electricity is low (and, outside NFFO, the price likewise) and that hot water is pumped round the DH system during the day to save on the amount of steam that has to be diverted from generating electricity during the day when prices are higher. This and other remarks indicated that SELCHP are taking a serious look at the overall market, post 1998, to see if there is a better deal to be had.

SOLAR ENERGY AND PHOTOVOLTAICS

This subject was covered in a long paper by Emeritus Professor John Page who is very strong on global warming and the real need, as he sees it, to do something about it. As a corollary to other forms of renewable energy he advocates more attention being paid to building design and layout to make more use of solar heating. He makes the very valid point that:

"we are building houses now that will still be in use in 60 years time, they should be designed for the energy scenario 30 or 40 years on"

That is applicable even without global warming which, as the Professor points out, will reduce energy demand, as current wisdom indicates that fossil fuels will then be in very short supply. As an example of current developments, he mentions transparent insulating materials which are used as a cladding and allow the heat from sunlight to go through to heat up a darkened wall but do not allow that heat to be re-radiated, so that the walls act like large night storage heaters. This implicitly poses the crucial question which applies to much of what he advocates; these materials are expensive and will considerably add to the cost of a building - how is their use to be encouraged? The initial cost of the building is a prime consideration but the cost in use is important but less understood. In this context he makes an important point that the 'playing field' is tilted against solar energy and energy efficiency because, although renewable energy is subsidised, insulation and materials that can help reduce the energy demand are penalised by being subject to VAT.

Professor Page did not have a great deal to say about photovoltaics, but noted that conversion efficiencies were steadily rising and costs steadily falling. However, it was still roughly 10 times more expensive than grid power and was limited in its application to remote locations where expensive electricity was better than none and a conventional supply would be just as expensive. He cited the fact that there are over 50,000 PV powered vacation homes in Norway - where half the population seems of own a little island in the skerries with a wooden hut and a large flagpole! Development would be in niche markets for the moment but will become more important as energy prices rise.

LANDFILL GAS

Harry Wyndham of Combined Landfill Projects Ltd extolled all the usual virtues ascribed to LFG and called it the most successful part of the NFFO scheme. And so it should be; I happened to be working on a joint venture for a major scheme just before the NFFO scheme came into being and we reckoned that we would be happy with a price of 3.5p/kWh if we had to allow for all the capital costs, and 3p/kWh if we discounted the capital that would have had to be spent on a collection and flaring system. When, after I had retired, the NFFO 2 price was set at 5.7p/kWh it was evident that the operators of that scheme and several others would laugh all the way to the bank. But, of course, geography has a lot to do with it; that particular site was about as favourably placed to connect to the distribution network as is possible. Others will not be and the cost of connection may be a significant cost factor.

In reply to my enquiry as to whether he had looked at the post-NFFO situation which might be next year for LFG - and considered only using the gas to generate in daytime on weekdays when the prices were higher; Mr Wyndham said that they had and thought it was the way to go. For all its virtues, a dyed-in-the-wool EfW man cannot refrain from remarking that it is a very inefficient way of recovering the energy from wastes.

Did the conference answer the question in its sub-title - 'A Major Contribution'? The answer must be 'yes - but over a long timescale'. Unless, that is, measures are brought in globally to override the market to combat global warming - any one country's lone efforts are not going to have a significant impact. As regards the UK it is probably better to spend money first on energy saving and energy efficiency than distorting the market to accommodate renewable energy.

Biomass - fuelling

By Steve Hodgson

A report from the Institute of Energy's conference on biomass, held in London last month.

Biomass is topical and levels of agricultural wastes and forest residues to make energy has grown to a level sufficient for an Institute of Energy conference. The subject drew speakers from across the world and an audience of a hundred delegates to London last month. Quite an achievement for an industry which clearly has a great future but to date has contributed nothing at all to the UK's electricity supply via the NFFO.

One sure sign that the UK biomass industry has reached a critical mass is that it now supports its own journal - *Biomass Farmer and User**. Edited and published by farming journalist and occasional producer of *Farming Today* on Radio 4, George Macpherson, the bi-monthly journal provides an excellent round-up of news and features for "those who produce and process crops for energy, fibre and industrial feedstock".

The lack of experience with large UKbased biomass energy projects led to the very diverse perspectives on show at the conference. We were treated to a view from Sweden, where forest residue projects are big business; to Shell's view of the global development of biomass schemes - mostly overseas; and to the very mixed US picture. From the UK, we heard Friends of the Earth's view of the importance of involving local communities in projects; British Biogen's thoughts on marketing green electricity; and a developer AEP's tales of the obstacles and difficulties inherent in bringing major new projects forward.

Sven-Olov Ericson of the Swedish electricity utility Vattenfall opened proceedings with an account of the biomass scene in a country which is half covered with forests. But even this amount of forest does not guarantee success. Around 25% of each tree is theoretically available, said Ericson, but this quarter is only worth 2% of the total value of the tree. Sweden nevertheless has around 15 major CHP stations fuelled by wood wastes producing 300 MW of power.

Sweden produces around 17% of its total energy use from biomass and peat, perhaps the highest proportion in the world and only approached by the similarly

forested Austria and Finland. Around half of the biomass used is at pulp mills; a further 20% in CHP/district heating plants and another 20% in larger homes. This last use is an environmental disaster, said Ericson, due to very low efficiencies and the carcinogenic smoke produced - although the wider use of modern wood-burning stoves would alleviate both of these problems.

Some sort of biofuel is used at almost every district heating scheme in Sweden, said Ericson - often in converted coal plants - and the use of biomass in CHP/district heating schemes is growing at about 10% a year.

The UK is a rather different proposition, said Alan Green of Associated Energy Projects, citing its incineration of just 4% of its municipal waste for energy recovery compared to 40, 65 and 80% for France, Denmark and Switzerland respectively. The UK is nevertheless moving towards biomass exploitation and AEP is seeking to build a business based on waste and biomass to energy projects.

The UK already has four major power stations fuelled by chicken litter, said Green, with room for a fourth in Northern Ireland. There are also four short rotation coppice projects in NFFO 3, totalling 19.5 MVV of generation capacity, with a further 16 MVV to come from new AEP projects. There is perhaps more scope for woodland residues projects, with 8.5 MVV of generation capacity included in NFFO 3 and plenty more on the way in NFFO 4 and the Scottish Renewable Order. In contrast, straw-burning projects are too expensive, said Green, and the future for agricultural sludges is still uncertain.

However, developing major projects has been a struggle. AEP had developed biomass schemes through the pockets of its collaborators in the past but this has since become almost impossible and the company is now moving towards involving the banks. But



Chairman Walt Patterson

the banks want to see all the areas of potential risk buttoned up before they will act - proven, reliable technology; turnkey contractors on board and secure, long-term fuel supply contracts in place. In effect the banks require all risks to be identified and guaranteed.

An added problem, said Green, was that the NFFO process prevented developers from achieving

high rates of return on projects, rates commensurate with the level of risk involved. NFFO throws out schemes with a rate of return which could be seen to be 'robbing' the process and the industry norm is thus around 15%.

The chairman for the day, the Royal Institute of International Affairs' Walt Patterson, asked if there is any extra benefit to be had for projects given their status as 'embedded' generation plants. Not to the project developer, said Green, who gets the NFFO income and nothing else, although something may be available after the NFFO contract ends after 15 years.

Olav Hohmeyer of ZEW Germany then told the story of the development of wind power in Germany, drawing out a few essential lessons for the biomass industry: develop technology by stages rather than in huge jumps; open the electricity grid to project developers; provide financial support for the energy produced rather than the investment made; and involve rather than ignore local investors.

Kings College's Professor David Hall then read the highlights of a paper by Tricia

the future

Allen of Friends of the Earth, which also stressed the need to involve local communities in biomass projects. Projects tend to have a large local impact by using a lot of land and being a continuous process rather than simply the installation of a piece of plant. The industry trade association British Biomass' Peter Billins

added that biomass projects should go much further than placating any negative local opinion; they are a positive opportunity to involve and employ local people.

The afternoon programme opened with an international view from JosÈ Alberto Lima of Shell International Ltd. Shell is currently testing the commercial potential of a

range of renewable technologies, including energy forestry through 'upstream' plantation trials and 'downstream' research into conversion technologies. Shell's thoroughly international perspective has led it to target its upstream activities in regions with an established forestry industry: Latin America, around the pacific Rim and in Africa. Countries suitable for downstream activities are selected according to how liberalised their electricity industries are!

Perhaps the most interesting paper of the day came from Ralph Overend of the US National Renewable Energy Laboratory, who tried to pull together experiences from a very diverse country. The US can resemble Sweden's forests in the north, but also grows sugar cane in Texas and Florida. Electricity from renewable sources began with 1978 legislation encouraging new renewables and CHP projects, and California had reached the heights of I GW of generation capacity by 1994. But the biomass scene had been blighted by great swings in its fortune which accompany the availability of different forms of biomass, eg straw suddenly became available as a fuel in California when legislation

was passed to prevent field straw burning.

Overend's main point was that only biomass operators who have control over the supply of their resource will succeed long-term. He added that co-firing should not be ignored, especially in the US which has so much coal-fired generating plant: even a 5% substitution in a 600 MW coal-fired

power station is an awful lot of biomass.

To illustrate the diversity of projects in the US, Overend then outlined five biomass projects in various stages of development: a gasification plant in Hawaii fuelled by sugar cane; an indirect gasification scheme using woodchips; a 75 MW project established by a cooperative of alfalfa growers in Minnesota; a project to co-

fire the equivalent of 35 MW of biomass in a 600 MW coal plant; and the Salix Project, to co-fire willow in two coal plants.

Why market green electricity was British Biogen's Peter Billins rhetorical question, the answer being to provide the industry with an opportunity to control its own destiny regardless of the activities of the electricity industry's Non Fossil Fuel Purchasing Agency. And to reinforce the point: "Heinz didn't look for 15 year contracts with customers before building a baked bean plant - it used marketing".

The deadline for completing liberalisation of the electricity market - 1998 - will provide a one-off opportunity, said Billins, to brand electricity by source as renewable and thus green. The industry could use the obvious green imagery - trees and wildlife - and perhaps make alliances with environmental organisations to reach a sufficient number of customers.

There is some urgency to market renewables-based electricity as projects with NFFO 1 or 2 contracts need to find new customers once their NFFO contracts expire in 1998. Two commercial organisations have started the process, initially marketing green electricity to business customers, and a 'green pool' is in the process of being established, added Billins. There is also a good deal of experience in the Netherlands, where three established electricity companies are selling renewables-based electricity at a premium of 10-20%. Some 30,000 households are already paying the premium, apparently, and more generating plant is planned to meet demand.

The day's conference ended with a paper from Mike Cannon of European Gas. Turbines Ltd, which has developed a turbine able to operate on biogases and now has two such machines operating, on gasified wood waste and gasified coal.

Ably, and sometimes entertainingly chaired by Walt Patterson, the event demonstrated that the biomass-to-energy industry is topical, diverse and growing.



Dr Ralph Overend of the US National Renewable Energy Labortory

Papers from the day priced £15.00 can be obtained by contacting the Institute. Biomass Farmer and User and George Macpherson can be reached on tel: 01566 86001, fax: 01566 86013.



Prof. David Hall who stood in for Tricia Allen

1300/08

US and Canada well ahead of Europe in low energy housing

'Energy Efficiency and Renewables: Recent North American Experience' by David Olivier

Energy Advisory Associates, 1996. I Moores Cottages, Bircher, Leominster, Herefordshire HR6 0AX, UK, £70 (pre-paid orders). Review by Dr Cleland McVeigh

In this report the author draws on his fact-finding visits to North America between 1993 and 1995. He has reviewed recent progress with both energy efficiency and renewable energy, especially in dwellings and in smaller non-residential buildings. Noting that housing in general is an area where the UK lags far behind North America, he points out that the region is demonstrating levels of energy efficiency and environmental awareness that are rare in the UK buildings. Many of the newer examples are holistic designs that respond successfully to many pressing environmental issues within a single project.

Noting that these integrated designs are spreading across the continent, the author comments that a new house in central Canada, which is one of the coldest regions of the planet, needs less energy for space heating than a new house in England or in neighbouring north-west Europe. The "normal" new house in Canada and northern USA uses no more energy than an "energy efficient low energy" UK house despite the colder winters. The North American utilities have the freedom to view improved energy efficiency as a strategic alternative to selling more energy. The cost of their investment in energy efficiency measures is recovered through the consumer's bills in such a way that all benefit.

On ventilation, North American research suggests that airtight buildings with mechanical ventilation provide a cleaner and healthier indoor environment than less-well ventilated buildings with natural ventilation. Advanced mechanical ventilation with heat recovery systems deliver the fresh air which a building needs in winter and recover 80% of the heat, using 5% as much electricity per unit of fresh air as UK systems.

Large parts of the USA now require net energy metering, and the utilities must pay the full retail price for the small amounts of electricity which consumers export to the grid from their own system, e.g. from roof mounted photovoltaic cells. The USA has about as many homes powered by stand alone PV systems as the whole of the third world.

The main section of the report consists of a detailed examination of some 60 building projects, 15 of which are illustrated on 2 pages of colour photographs. There is a wealth of state-of-the-art experience. described here. In the final chapter the author assembles his conclusions: in every technical area the North American experience is clearly superior to that in the UK ("the UK does not have mature markets in advanced technologies. At best it only has a scattering of one-off experiments"). Two pages give

reference sources and a bibliography, and some 40 "Principal Contact People" are also listed. There is a brief index.

The author writes with authority and clarity on what can be a daunting topic for the non-specialist. He has succeeded in placing many of the ideas and concepts firmly on record in an easily assimilated form. The report could be of considerable value to a number of different interest groups, ranging from practising architects and the Schools of Architecture to decision makers, especially those involved in energy and environmental policy issues.

Global warming for non-scientists - new perspectives

'Climatic Variation in Earth History', by Eric J Barron, and 'Biological Consequences of Global Climate Change' by Christine A Ennis and Nancy H Marcus University Science Books, Sausalito, California, both 1996. ISBN 0-935702-82-2 and 0-935702-85-7 Review by Dr C | Marguand

Describing themselves as booklets, these are two instruction modules from a series designed by college professors in America to provide interdisciplinary material on global change. They are aimed at undergraduate students from a non-science major and require two weeks of class study time. There are eight in the series available so far:

In Climatic Variation in Earth History, two case studies which examine the relationship

between the sun and the earth's radioactive interior, are presented. The first considers the Cretaceous period 100 million years ago where the geologic record indicates a relatively hotter climate in contrast to the more glacial one we are experiencing today. As the change has occurred over a long time period, it is suggested that a causative mechanism is at work, and it is postulated that for the movements of the earth's tectonic plates, which also affects carbon dioxide levels, were responsible for the warmer environment. The second investigates models of climate change, and in particular the possibility that the earth's orbital cycles determine the formation of ice ages. Both demonstrate well that a knowledge of the climate of the past can lead to a better understanding of what may happen in the future.

In Biological Consequences of Global Climate Change, the authors pontificate upon the effects a different climate will have on the natural world. Whilst they recognise that there are many uncertainties, their premise is that, although ecological change has happened before, global warming will occur rapidly, not leaving sufficient time for stabilisation and adjustment. Some ecosystems may benefit, but there is a warning given that the majority will not.

The series is written to capture the imagination and interest of non-scientists and in this it succeeds. It is refreshing to be presented with somewhat different yet accessible perspectives on the subject of global warming.



Setting the Standard NEMEX 1996 provided the Institute with a platform for at NEMEX and in 1997

revealing our professionalism in the area of Energy

Management. As many of you will know, Energy Management was one of our major themes for 1996 and NEMEX provided us with a superb platform for concluding the year's activity in this field. Setting the Standard for Managing Energy was the message that we were promoting at NEMEX . With it emblazoned across our T-shirts, a joint stand with ESTA, Louise Evans speaking at the conference on the Standards for Managing Energy and the way forward for energy professionals to gain recognition from them, as well as an award ceremony attended by the Parliamentary Under Secretary of State at the Department of the

Environment, Sir Paul Beresford, no one could have accused us of having a 'low' profile. Previously in Energy World we advertised opportunities for you to become involved in a pilot programme in which you could gain 1 or more NVQ units in Managing Energy or TDLB units if you wished to become an assessor. Thirty energy management candidates and 10 assessor candidates replied, this was back in June. After 6 months of rigorously testing the NVQ infrastructure and interpretation of the standards, as well as collecting evidence for candidate portfolio's, the fruits of their labour became apparent when Sir Paul Beresford awarded the successful candidates their NVO unit certificates in Managing Energy. Eight assessors were also



Above: Congratulations to (left to right) Doug Smithson who is now a qualified assessor, John Allen, David Pybus & Keith Mayes who were awarded their NVQ units in Managing Energy. The Institute of Energy would also like to congratulate all those who were successful in gaining their awards

Below: Peter Johnson, President, Sir Paul Beresford, & Dr Alan Willmott (UODLE) enjoying the ceremony



awarded 'Assessor' certificates, giving them the national recognition that they sought and proving that our pilot programme had been a huge SUCCESS

In summary this is what The Institute of Energy and partners have produced to assist energy management professionals.

The Good Energy Manager's

Guide to help you get to grips with the standards (launched in January)

- The CPD Manual in Managing Energy which allows you to assess your competence against the standards (launched in February)
- TEMOL training in Energy Management through Open

Learning will provide you with the necessary underpinning knowledge and understanding needed to meet the standards (mapping exercise completed in September)

 NVQ units in Managing Energy will provide you with the recognition that you competently perform energy management functions (tested in 96, available nationwide in January)

All the hard work has been done in 1996, all you need to do is to use these products in 1997 and reap the benefits!

Louise Evans & Louise Collins are available to come and talk about the Standards for Managing Energy and their associated products should you wish to learn more about the benefits for you and your organisation. Please contact us on Tel: 0171 580 7124, or Fax: 0171 580 4420. email lcollins@ioe.org.uk

CONGRATULATIONS

The Institute of Energy would like to congratulate Michael Roberts on receipt of his OBE. We would also like to thank him for his invaluable contribution to Energy Efficiency and Energy Management, and his commitment to the Institute's work in this field.



Stop And Reconsider:

The new Engineering

Council have now issued for comment the final draft of the NEW Standards and Routes to Registration (SARTOR). Like the curate's egg it is good in parts but the whole is inedible. The initial response of the Institute of Energy is that we have doubts with the document in its present form and question giving it unqualified support. It is, without doubt, weighed heavily in favour of the bigger educational establishments and institutions. Indeed, it can even be viewed as a thinly disguised ploy to force the smaller bodies to re-examine their thinking on amalgamations!

We will be told, of course, that this has not been produced by the Engineering Council, but by the Institutions Working Group which is composed of institution members, therefore we are imposing it upon ourselves! The Secretary of this Institute has also been told by a representative of the

Engineering Council that "there can be no

fundamental changes at this late stage'' and ''the debate is

closed". Why, then, issue a consultative document?

The document is too large to print in its entirety within the covers of *Energy World*^{*} but in brief it aims to give streams of:

- fewer and better Chartered Engineers.
- more and better

Incorporated Engineers, and a continuing, increasing

stream of Engineering Technicians.

To achieve this it is proposed that the Benchmark for the academic part of the path to CEng should be a 4 year MEng

"the debate is closed"

degree. The BEng(Hons) degree is retained, somewhat in limbo, which can lead the student up, down or nowhere at all. The academic part of the IEng requirements is a BEng Ordinary degree in place of the former HNC/HND routes, and the requirements for the Engineering Technician grade are essentially unaltered. Entry standards are also imposed on the academic establishments which are set at 24 UCAS Points for the MEng degree, 18 for the BEng(Hons) and 6 for the ordinary BEng. In the first two cases the requirement covers 80% of the

"It's never too late to step back to take a better leap"

intake in a given year.

There is, of course, much more in the new SARTOR 96 dealing as it does with Initial Professional Development, the Professional Review, CPD etc. All of which throws additional burdens on the institutions but this article deals only with SARTOR as it relates to the main pathways to registration, which is central to the document.

Taking advice from our own representatives within academia we question the fundamental reasoning behind yet another change to the rules governing

the education of engineers? What does it really do to improve the image of the engineering profession? Does it do anything to attack the real problem - that of a proper recognition of the profession and the attraction of good quality students across the broad spectrum? Or will the fate

"Surely the aim must be to enhance the status of the profession"

of future registrants be likened to the oysters in The Walrus and the Carpenter - "And answers came there none. And this was scarcely odd because they (the system) had eaten every one"!

The Institute agrees with the concept of a broadly based

> MEng degree but NOT for the objective of producing fewer, and arguably better, Chartered Engineers.

Surely the aim must be to produce better educated and trained engineers at ALL professional levels and enhance the status of the profession. We believe that the objectives relating to registration can be realised not by discarding all that has gone before, but by amending and adding to the current system. This has the added advantage of minimal disruption to the procedures used to produce future registrants, whilst adding a new dimension to the status of engineers.

We have therefore considered ways in which we can utilise the existing SARTOR 90 document and not throw the baby out with the bath water (see Chart). Our contention is that there is no need to start afresh with a blank sheet of paper. As the requirements for the Engineering Technician grade are essentially

> unaltered we have started our deliberations from the grade of Incorporated Engineer.

The academic entry requirement to Stage 1 of the IEng register in the new SARTOR 96 document has been raised to a BEng ordinary degree and we agree that this should be phased in over time. This will assist in highlighting the professional standing and status which we feel this grade deserves. The BEng(Hons) degree is retained under our proposal as the entry requirement for CEng. This will maintain the status quo of the majority of current registrants and will obviate the need for academia and institutions to change their current admission procedures.

The MEng degree we see as entry to an additional register called, for the sake of this article



The Other Remedy

and subject to agreement on eventual title, Professional Engineer (PEng). Details such as minimum age, length of training and relevant experience etc can all be agreed but here is the basis for the "fewer and better 'Professional' Engineers" whilst still retaining the mainstream of Chartered Engineers and enhancing the status of Incorporated Engineers. Essential ladders and bridges can and must also be built in to the new framework.

This is the third, (CEI; 'old' Engineering Council; 'new' Engineering Council), and possibly last chance to address the concerns and problems of the engineering profession and we MUST get it right. There is no justification in hanging on to something just because it has taken three years to reach this point. If where we have got to is wrong or unsound then we must have the courage to look again. The time constraints placed on reaching a conclusion are our own and can be moved. There is no penalty clause hanging over our deliberations except the penalty of having something which is unworkable and therefore damaging to the future.

It is never too late to step back to take a better leap.

J E Leach Executive Secretary

* Members can receive a full copy of Part I of the document by applying to the Institute.



MAIN PATHWAYS TO REGISTRATION



Please note that these events are subject to change. For up-to-date information telephone the contact for the event. When further events are scheduled details will be released at the earliest opportunity. If refreshments are planned please advise the contact of your attendance to the event.

January 1997

NORTH WEST BRANCH

Wednesday, 29 January Visit to North Trafford College. Contact Mr E Curd, tel: (0151) 625 6744

NORTH EAST BRANCH

Wednesday, January 29 "Design and Construction of Offshore Process Plant" by Bill Oliver (AMEC), Newcastle University, Merz Court, room L101. Contact Mr C Howarth, tel: (0191) 222 7303

NORTHERN IRELAND

Friday, 31 January, 12.30pm A visit to Technology Unit at the University of Ulster, Carrickfergus. Contact Dr P Waterfield, tel: (01232) 364 090

February 1997

SCOTTISH BRANCH

Tuesday, 4 February Site visit to Osprey II Wavepower Project Manufacturing Facility, Clydebank. Contact Mr R Loudon, tel: (0141) 332 4153

NORTH WEST BRANCH

Tuesday, 4 February "Strategic Energy Planning", Risely Conference Centre, Warrington. Contact Mr E Curd, tel: (0151) 625 6744

EAST MIDLANDS BRANCH

Wednesday, 5th February, 6.30pm. Carlsberg-Tetley Burton Brewery, Burton upon Trent. Energy applied in the food and drink industry - lecture and tour not all day boozing! Contact Mr G Thompson, tel: (01509) 212670

MIDLAND BRANCH

Thursday, 6 February "Landfill Gas" by Dr. R Eden, Managing Director, U.K. Plant Services Ltd. Contact Mr DEA Evans, tel: (01384) 374329

INTERNATIONAL COMMUNICATIONS FOR MANAGEMENT - ICM In association with The Institute of Energy Thursday 6th, Friday 7th February "Energy Management -Maximising Your Buying Power Through Innovative Strategies" -Euston Plaza hotel. For further details contact ICM tel: (0171) 499 0900

LONDON AND HOME COUNTIES BRANCH

Tuesday, 11 February, 5.30pm Technical visit and presentation -National Grid Company, St Catherines Lodge, Wokingham. Contact Mr PM Johnson, tel: (01793) 893330

NORTH EAST BRANCH

Tuesday, 18 February "Windpower Generation in the UK" Mr Guy Nicholson (ECONNECT LTD) at Newcastle University, Merz Court, room L101. Contact Mr C Howarth, tel: (0191) 222 7303

SOUTH WALES AND WEST OF ENGLAND BRANCH

Thursday, 20 February, 6.00pm "Energy Use in The Royal Mint" by David Honeyman, Energy and Utilities Manager, The Royal Mint. University of Cardiff, Engineering Block, Newport Road, Rooms 19/20, Trevithick Building, Contact Mr S Wilce, tel: (0121) 6439621

NORTH WEST BRANCH

Thursday 20, Friday 21 February "Invent Conference" University of Stuttgart. Contact Mr E Curd, tel: (0151) 625 6744

NORTH WEST BRANCH

Monday, 24 February "Monitoring and Targeting to achieve Saving on Energy Cost". Risley Conference Centre, Warrington Contact Mr E Curd tel: (0151) 625 6744

YORKSHIRE BRANCH

Wednesday, 26 February, 6.30pm Site visit to CCGT Power Station at Keadby, South Humberside, reservations by application form. Contact Mr A Mallalieu tel: (0113) 276 8888

ENERGY INDUSTRIES

Wednesday, 26 February "Energy Policy" James Wallace MP, Liberal Democrat. If you would like further details on becoming a member of this luncheon club allowing you the opportunity to enhance relationships with directors, managers and senior executives of companies and other organisations in the energy industries. Contact Dr GG Thurlow, tel: (01684) 574481

NORTH WEST BRANCH

Wednesday, 26 February 6.00p.m. "Nuclear Issues", AEA, Thompson House, Risley. Contact Mr E Curd, tel: (0151) 625 6744

South Wales & West of England Branch

24th Idris Jones Memorial Lecture

CANDIFF CASTLE FRIDAY, 21 MARCH 1997

"The Energy Market The story so far and the road ahead"

Dr Brian Count PhD, MA (Cantab) Operations & Technology Director, National Power plc

The Lecture will be held at 11.00am (coffee & reception at 10.30am) and will be followed by the Branch Annual Luncheon at 12noon for 1.00pm.

Admission is free to the lecture but those wishing to attend should apply for tickets. Tickets to the luncheon are priced at £8.00 per head inclusive of coffee and pre-lunch drinks.

Apply in writing & enclose cheques made payable to The Institute of Energy, to Mr David Suthers, 2 Danybryn close, Radyr, Cardiff, CF4 8DJ

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