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# energy



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Electricity trading

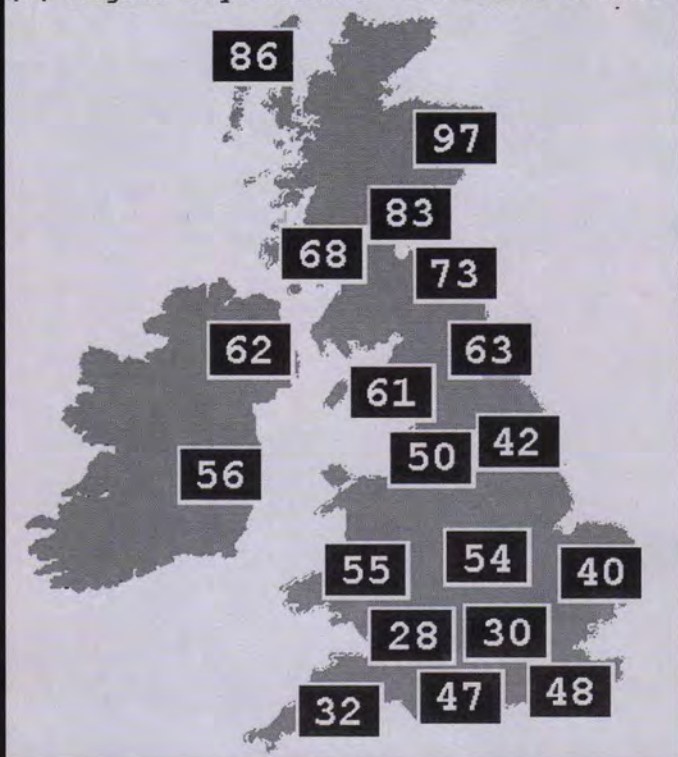
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## COVER

Electricity transmission and distribution - this month (November) was to have seen the start of a new era for the UK electricity industry and its users, as 'new electricity trading arrangements' (NETA) came into force to replace the much-criticised electricity Pool. However, due to delays in testing the new systems, it now seems certain that NETA will have to wait until early next year. *Energy World* readers will be well-informed, though, by the feature which starts on page 8 and covers both the principles of the new arrangements and some IT solutions being adopted by industry players.

Picture courtesy of National Grid UK.



## From the climate to petrol and back again



Steve Hodgson

**I**t's not so often that the energy matters covered routinely in *Energy World* make the headlines - I mean front page headlines and first TV news story status. So it will be interesting to watch coverage of the latest international meeting of governments on climate change - COP6, or the sixth "Conference of the Parties" to the United Nations Framework Convention on Climate

Change - to be held in The

Netherlands later this month (November).

Governments will meet to finalise the unfinished business from 1997's Kyoto meeting of the parties; indeed the outcome of COP6 will determine the environmental effectiveness of the Kyoto Protocol. We will report the outcome of the event in the next issue of *Energy World*.

Is COP6 important? Certainly, but climate change is still a rather abstract concept for many. To aid understanding of its human effects, Friends of the Earth has released a worrying catalogue of peak weather events that have occurred in the last few weeks and which might be attributable to climate change.

According to FoE, events reported just in August and September this year included: the worst floods in decades to hit the Mekong delta, which killed 300 people in Vietnam and Cambodia; flooding and landslides from the country's worst rains in at least a century, which caused the evacuation of 45,000 people in Japan; the worst monsoon-driven floods in decades, which hit the Indian state of Andhra Pradesh, killed 165 people and left thousands homeless; a five month drought and ensuing forest fires, which caused \$300 million worth of damage in Croatia; forest fires which affected 650,000 hectares across 13 states in the mid-US; Iran's worst drought in 30 years, which has killed 800,000 head of cattle ..... the list goes on and on.

And, while no-one can say how much of this devastation was over and above historical patterns, and thus likely to be caused by climate change, the scientists do confirm that the 1990s was the warmest decade of that century, and 1998 the warmest year. "It is no longer a question of whether the earth's climate will change but when, where and by how much", said John Robert Watson, Chairman of the IPCC in 1999.

Putting it another way, the world's reinsurance industry reports that weather related events in 1998 alone took an estimated 32,000 lives and displaced 300 million people from their homes - more than the population of the US.

Looking at longer-term events: a mosquito-borne disease

originally from Egypt is now killing people in New York; ten years of drought have helped create new deserts in northern China; rainfall in south east Australia has been the lowest since 1900 for each of the last four years; the highest sea temperatures ever recorded in the Caribbean have killed much of the Belizean coral reefs; 80-90% of coral in the Seychelles is also dead; glaciers are retreating faster than ever; and even polar ice is thinning - see story, opposite.

Bringing it closer to home, were south east England's floods in mid October - floods which may cost insurers twice as much as the 1987 hurricane - a product of global warming? Again, no-one can be sure.

Now contrast the public perception of climate change with Britain's so-called petrol crisis of September this year. This "crisis" broke all records for media coverage of an energy event - top story in news bulletins included - and led to people at home learning about the fuel price escalator, something previously only discussed in the pages of this and similar magazines.

Yet what was depressing about the petrol "crisis" was the almost complete absence of any discussion of the reason the escalator was established in the first place - to curb carbon dioxide emissions from the only sector still on a dangerous emissions growth curve. Subsequent market research suggests that most people are willing to pay fuel taxes at current levels - as long as a proportion is spent on cutting pollution.

Petrol and diesel prices had hit vertiginous levels, but this had as much to do with sky-high international oil prices, which have since softened, than the fuel price escalator, which Labour abandoned some time ago. Environmental campaigners tried hard to point out that, prior to this year's price rises, the cost of motoring was no higher in real terms than it was 25 years ago, although both train and bus fares have risen by over 50% in the same period - hardly encouragement for less polluting transport alternatives.

For those who did not rely on cars to get to work, the petrol "crisis" had its plus side - for a couple of days roads had sensible amounts of traffic on them. People gave public transport a try, and one Institute of Energy employee said that cycling to work in London had been "a joy".

In fact the petrol "crisis" served to show us how tied to traditionally-fuelled cars and trucks we all still are.

But perhaps the most interesting angle was an accusation of "collusion" originally levelled by environmentalists at the oil industry; that it somehow suited the oil majors to see protests at the price of oil products just a few weeks before the vital COP6 meeting in November. Wouldn't protests and the ensuing supply difficulties aid oil lobbyists' arguments that climate treaties are only likely to raise new, unfair taxes on essential fossil fuels - which the people clearly can't afford to pay?



## Climate change has world skating on thin ice

**The discovery** of open water at the North Pole by an ice-breaker cruise ship in mid August surprised many in the scientific community. This finding, combined with two recent studies, provides not only more evidence that the Earth's ice cover is melting, but that it is melting at an accelerating rate, according to international environmental

campaign organisation the Worldwatch Institute.

A study by two Norwegian scientists projects that within 50 years, the Arctic Ocean could be ice-free during the summer. The other, a study by a team of four US scientists, reports that the vast Greenland ice sheet is melting.

The projection that the Arctic Ocean will lose all its

summer ice is not surprising, since an earlier study reported that the thickness of the ice sheet has been reduced by 42% over the last four decades. The area of the ice sheet has also shrunk, by 6%. Together this thinning and shrinkage have reduced the Arctic Ocean ice mass by nearly half, says the Institute.

Meanwhile, Greenland is

gaining some ice in the higher altitudes, but it is losing much more at lower elevations, particularly along its southern and eastern coasts. The huge island of 2.2 million square kilometers (three times the size of Texas) is experiencing a net loss of some 51 billion cubic meters of water each year, an amount equal to the annual flow of the Nile River.

## India, Germany and UK team up on climate change

**India's Ministry** of the Environment and Forests (MoEF) and the UK's Department of the Environment, Transport and the Regions (DETR), have joined forces on a three-year study into the potential effects of global warming over the next 80 years.

Indian scientists will carry out studies to build a comprehensive picture of the possible future impacts of

climate change in India, with the UK DETR providing £650,000 to fund the initial studies and programme management. The project will also involve the UK's Hadley Centre for Climate Prediction and Research.

The programme of research will include the development of climate change and socio-economic scenarios

for India and assessment of impacts on water resources, agriculture, forests, industries, energy and transport, human health and coastal zones.

Meanwhile Germany and the UK have set out a common aim: to see the Kyoto Protocol enter into force by 2002, ten years after the Rio Earth Summit. Michael Meacher, UK Environment Minister, and

Jurgen Trittin, Federal Minister for the Environment, Nature and Reactor Safety, Germany, called for ministers around the globe to show 'political will' to make the 1997 Kyoto Protocol ratifiable at the sixth Conference of Parties to the Framework Convention on Climate Change (COP 6) at The Hague, Netherlands, this month.

## Australian oil shale project 'put on hold'

**Canadian Suncor Energy Inc** has put on hold the next stage of development of its problematical Stuart joint venture oil shale demonstration project in Australia, "until operational issues and concerns about environmental and social impacts are addressed".

Shale oil is a form of 'non-conventional' oil which requires mining rather than drilling, and a highly energy intensive technology to extract the oil from the shale.

Suncor has been investing in oil shale technology since 1997 when the company and its joint venture partners began constructing an oil shale

demonstration plant near Gladstone, Australia. Over the last year, operational and environmental issues have delayed commissioning and the company has undertaken tests to determine the extent of the additional work needed to improve operational performance.

"Our first priority is to operate the plant reliably and address community concerns about plant emissions and noise," said Rick George, Suncor president and chief executive officer. "We're going to focus on this effort and put further stages of development on hold until the operational

challenges are resolved."

In addition to resolving operational issues at the Australian plant, George said other sustainability issues must be addressed if oil shale development on a commercial scale is to be successful over the long term.

The company is wary of added carbon dioxide emissions which will follow the mining of oil shale, citing "greenhouse gas management plans that align with future national and international commitments to address the risk of climate change" among the criteria it plans to use to assess the future for the plant.

Suncor's announcement shows that greenhouse intensive industries are no longer economically viable, according to environmental pressure group Greenpeace. Paul Horsmen, oil campaigner for the Greenpeace International's climate campaign said "Suncor has recognised that the carbon intensity of this industry is a huge financial liability. Greenhouse emissions are going to cost big dollars and even if Suncor can fix the plant's technological problems, it is never going to be able to bring down the greenhouse intensity of shale oil to an affordable level – financial or environmental."



## GdF, EdF show off 200 kW fuel cell installed in Paris

**Gaz de France (GdF)** and **Electricité de France (EdF)** have put on show the fuel cell that they have brought into service at France's first full-scale experimental facility for local power generation.

Energy efficient, clean and silent, the gas-fuelled phosphoric acid cell is installed in Chelles in the Seine-Et-Marne Department in the suburbs of Paris. At 200 kW electrical and 220 kW

thermal, it supplies the equivalent of 200 dwellings with heat and electricity.

The generator is connected to the town's electricity network, to which it delivers power at 400 V, as well as a district heating system, which it supplies with water at 80°C.

The cell is made up of a generator module, which consists of: the system for converting natural gas into

hydrogen; the unit generating electricity and heat, called the 'cell core'; the electrical power converter which converts direct current into alternating current, and the cooling module, whose task is to ensure normal operation of the cell in the event of low demand for thermal energy from the heating network.

The fuel cell makes it possible to produce electricity

and heat locally, direct from the chemical energy of hydrogen and oxygen, without combustion or the intermediate production of mechanical energy. The technology should be competitive within five to ten years, say GdF and EdF.

American company ONSI manufactured the cells and Cofathec Services operates and maintains the installation.

## Olympic marathon runners in choke-free zone

**The Sydney 2000 Olympic Games** showcased not only the best in human athletics, but also a number of energy efficiency and renewable energy technologies.

Most of the new sporting venues included daylighting and natural ventilation designs. Green power - electricity from renewable energy sources -

provided all the electricity for the Sydney SuperDome, which also sported a 70 kW solar electric system on its roof. Many of the buses that shuttled spectators among the venues were powered by compressed natural gas. At the Olympic Village, energy efficiency and passive cooling designs cut energy use by 50%.

Rooftop-mounted solar photovoltaic panels throughout the Village are generating a million kWh of electricity each year - roughly equal to its energy usage - leading some to call it "the world's largest solar suburb."

The racers in the men's and women's Olympic marathons had no concerns about noxious

fumes from the pace car, which was fuelled with hydrogen. The HydroGen I, developed by General Motors affiliate Opel, carries liquefied hydrogen to supply a fuel cell, which generates electricity while emitting only water vapour. The electricity powers an electric motor to drive the vehicle.

## LA to use renewables, demand-side management

**Los Angeles City Council** Department of Water and Power (DWP) plans to meet roughly half of its projected need for nearly 1000 MW of new power generating capacity over the next ten years with renewable energy sources, distributed generation,

and demand side management (DSM).

According to DWP, it will use demand side management to reduce its projected load by 245 MW, while providing 150 MW from renewable energy facilities such as wind,

geothermal, and landfill gas power plants. Distributed generation will provide about 70 MW, of which 15 MW will be generated from solar photovoltaic electric systems.

Other distributed generation technologies will

include fuel cells, microturbines and solar energy systems. Demand side management will include technologies and programmes that reduce electrical use, particularly during peak usage hours, as well as energy efficiency.

*Cummins Power Generation has supplied five standby generating sets, with a total rating of 2.1 MVA to the West End City Centre shopping mall located in the heart of Hungary's capital Budapest. The recently opened mall has 400 shops on three levels, a seven-storey office block and*

*a 230 room Hilton Hotel, a landscaped roof garden with jogging track, a 30m-high representation of Niagara Falls as well as a 14-screen multiplex cinema.*

*Standby power for the shopping mall is supplied by a standby set rated at 1110 kVA and housed in an acoustically*

*treated room within the mall's underground car park. The set is controlled by a Cummins 'automatic power command' system, which ensures that the set is on-load within 12 seconds in the event of a mains failure. Three standby sets have also been installed on the top floor*

*of the office block and a further unit on the top floor of the hotel.*





## Renewables 'obligation' from next year

**The Government has** confirmed its target of 10% of UK electricity requirements being met by renewables by 2010 (and 5% by the end of 2003) – but repeated that the target is dependent on the cost to consumers being acceptable. A new obligation “on all licensed electricity suppliers in England and Wales to supply a specified proportion of their electricity supplies from renewable sources” will start in October next year.

In *The Renewables Obligation – Preliminary Consultation*, the Government has also announced that offshore wind and energy crops will be eligible for capital

grants as well as support under the new obligation, and that energy-from-waste – while being counted towards the 10% target – will not be included in the obligation.

But perhaps most interest centred on the ‘buy-out price’ – the price at which electricity suppliers can ‘buy out’ of their obligation to source power from renewables should costs be prohibitively high. The Government is consulting against a suggested level of 3.0 p/kWh, or £30/MWh).

In his foreword to the paper, Trade and Industry Secretary Stephen Byers writes on the cost of renewables:

“Fuel poverty remains an issue for too many families and individuals in the UK, while its direct impacts have implications throughout the economy and the environment. Ensuring that electricity prices do not rise by an excessive amount as a result of our drive to encourage renewables has therefore been an important part of our decision making process.”

The Government plans to give suppliers a further incentive to meet, rather than buy-out of, their targets by recycling receipts from buy-outs to suppliers, in proportion to the quantity of renewable electricity supplied.

The document suggests that the 5% target for 2003 would most likely be met by renewables capacity already in place and schemes still to be brought on-line under the previous, NFFO support mechanism. The new obligation, which will remain in place until 2026, will encourage progress towards the 10% target.

The Government has given electricity suppliers, renewables generators and consumer groups until 5 December to reply to the paper; it then plans to lay the first renewable obligation order before Parliament in April or May next year.

## Local authorities pledge to cut carbon emissions

**Twenty-four local** authorities from across England and Wales have pledged to cut their levels of greenhouse gas emissions at the launch of the ‘Councils for Climate Protection’ (CCP) initiative in London.

As members of the CCP pilot, each Council will undertake a five stage ‘climate action plan’, with the aim of quantifying the current levels of

emissions in their area, and then developing and implementing a strategy to achieve substantial cuts in emissions.

The CCP links into a international programme of action involving 400 local authorities across the world, run by the ICLEI (International Council for Local Environmental Initiatives). In total, the Councils involved in

the ICLEI scheme world-wide account for almost 10% of global greenhouse gas emissions and many in other countries have already achieved impressive cuts in emissions.

In addition to supporting the work of the 24 pilots, the CCP will be assisting all local authorities across England and Wales through the preparation of best practice case studies

and the organisation of a series of regional workshops on climate change.

Councils for Climate Protection is funded by the DETR and is part of the Government’s Draft Climate Change Strategy. The CCP is being run by the Improvement and Development Agency and is also supported by the Local Government Association.

**The Peterhead steam power plant, located north of Aberdeen in Scotland, has been re-powered by the Siemens Power Generation Group (KWU) as a turnkey project to form a combined-cycle station. The plant was taken over by Scottish and Southern Energy plc on schedule in August 2000.**

**In the new power plant configuration, devised jointly between both companies, hot exhaust gases from the three Model V94.3A gas turbines are used to raise steam in downstream heat-recovery steam generators for Unit 1 of the existing steam power plant. This upgrade increases the total capacity of Unit 1 of the gas-fired plant from 660 to around 1,200 MW operating in purely combined-cycle mode. At the same time efficiency has increased by around 18%, attaining a figure of about 55%, says Siemens**





## Coalite to 'cook' tyres to make oil

**The makers of smokeless coal** plans to produce oil from waste tyres by utilising a process invented nearly a hundred years ago to solve the smog problems caused by burning ordinary coal.

Worn vehicle tyres are one of the world's biggest environmental recycling problems. Whilst some scrap tyres are used to generate energy or used in the manufacture of carpet underlay, a high percentage are being dumped at landfill sites. But tighter laws governing the disposal of tyres will mean a major rethink for those wishing to dispose of them in the future.

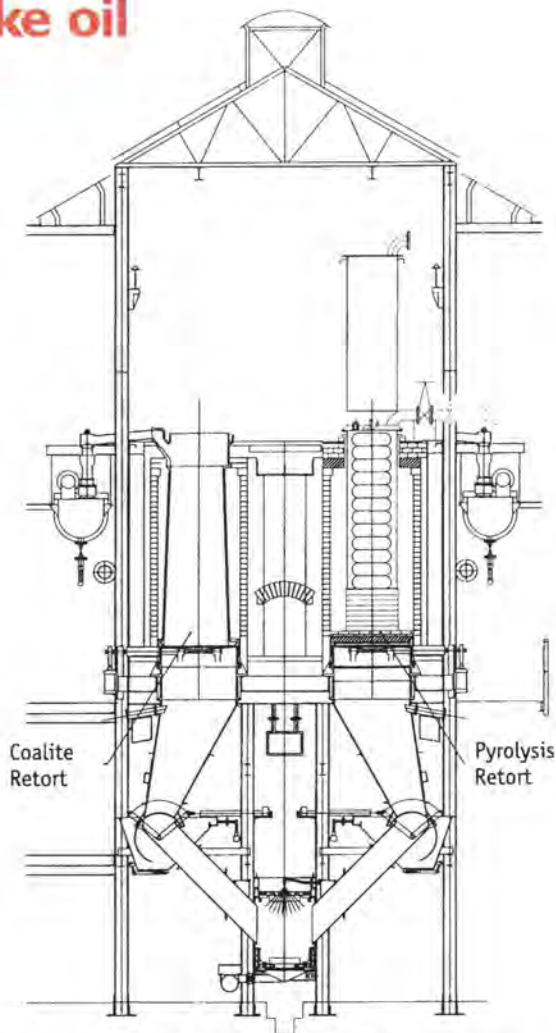
Coalite, based in Bolsover near Chesterfield, has discovered that their low temperature process for 'cooking' coal to remove the smoke which caused the smog problems of the 50s and 60s, can be modified to cook tyres. The process produces a range

of useful by-products, including oil, in useable and cost-efficient quantities.

The existing Coalite process involves the low temperature carbonisation of bituminous coals in vertical cast iron retorts at around 640°C. Forty retorts, each able to hold around 300 kg of coal, are assembled in two rows. Coalite engineers have, with Environment Agency approval, utilised the existing technology and converted existing retorts to pyrolysis chamber.

Coalite has the capacity to process up to 60,000 tonnes of tyres every year, made possible due to the fall in demand nationally for smokeless coal.

Funding for the project has been agreed by Coalite's parent company, Anglo United Limited and its bankers. Negotiations are currently taking place to secure adequate and continuous supplies of tyres for processing which is planned to start in April 2001.



**New stainless steel pyrolysis chambers fit comfortably within existing retorts**

## Minister welcomes North Sea activity

**Energy Minister Helen Liddell** has welcomed a flurry of activity in the North Sea, suggesting that it represents the first fruits of the Oil and Gas Industry Task force, now known as PILOT. "There is no scope for complacency but a framework has been put in place which can extend the prospects for companies and employment in the North Sea and in the communities dependent on it."

Welcoming first production from the Shell operated Shearwater field as she

officially inaugurated the platform and processing facilities offshore, Mrs Liddell called the development: "a milestone in the continuing development of UK North Seas - developments like Shearwater show that the UKCS is still a place to do business and boost the impact of the successful initiatives stemming from PILOT. The 473 km long pipeline to Bacton provides scope for even more developments in this part of the North Sea and provides infrastructure opportunities for

gas export from the Central North Sea to Europe."

Welcoming new investment plans for the UKCS from BP, the Minister added: "Eighteen months ago the prospects for North Sea oil and gas seemed bleak, but a new spirit of co-operation between Government and industry, and between large and powerful companies and smaller more vulnerable enterprises has come out of it."

Ms Liddell also inaugurated the £540 million Triton Project at the offices of Amerada Hess

in Aberdeen, and welcomed Kerr-McGee's plans to develop the Leadon field. Speaking of Leadon, Ms Liddell said: "I am delighted to see that the floating production, storage and offloading topsides are planned to be built in the UK at Swan Hunter's yard on Tyneside, securing around 800 jobs for the next 12 months with detailed engineering of the facilities by Aberdeen based Brown & Root Energy Services Ltd. This announcement will provide a timely boost to the supplies industry in the UK."



## Innogy acquires Independent's customers

**Innogy Holdings plc**, the UK business of National Power, has acquired for £10 million the major supply business assets of Independent Energy, which went into receivership in September as the first major casualty of the UK's liberalised energy markets.

Innogy's acquisition represents a fairly smooth transition to a new supplier for

most customers. Customers have been contacted individually by Innogy, which has acquired:

- contracts to sell electricity to approximately 240,000 customers, including 100,000 domestic customers,
- contracts with 80,000 domestic gas customers,
- up to 12 TWh of sales to certain industrial and

commercial customers,

- York Gas, a gas supply business,
- 174 permanent employees, and
- all systems, fixed assets and property required to support these contracts.

Innogy has assumed responsibility for supply continuity with customers, backdated to 9 September 2000 when the receivers were

appointed. In addition, the company will collect unpaid accounts for all Independent's customers up to that date on behalf of the receivers and will receive a cost allowance and commission payments for this activity. The administrative receivers from KPMG will continue to run the generating and resource business of the Independent Energy Group for the moment.

## Tories 'would abolish Labour's energy tax'

**The next** Conservative Government would abolish the climate change levy: "Labour's energy tax", according to Conservative Environment Spokesman Damian Green MP.

If elected, the Tories would, according to Mr Green:

- promote greener cars and cleaner fuels, through new technology not higher taxation,
- replace Labour's energy tax

with tradable emissions

- permits, to encourage industry to reduce emissions in an efficient, market-driven manner,
- encourage more gas-fired power stations, so allowing

dirtier energy sources to be replaced,

- support energy efficiency measures in people's homes – especially amongst the elderly and the vulnerable.

## Coalbed methane tapped for power

**Deutz Energy** has won a contract to supply, operate and maintain power stations up to a total of 30 MWe for Octagon Energy, an independent power generation company specialising

in coalbed methane (CBM) technology. The initial order under the contract is worth in excess of £5 million.

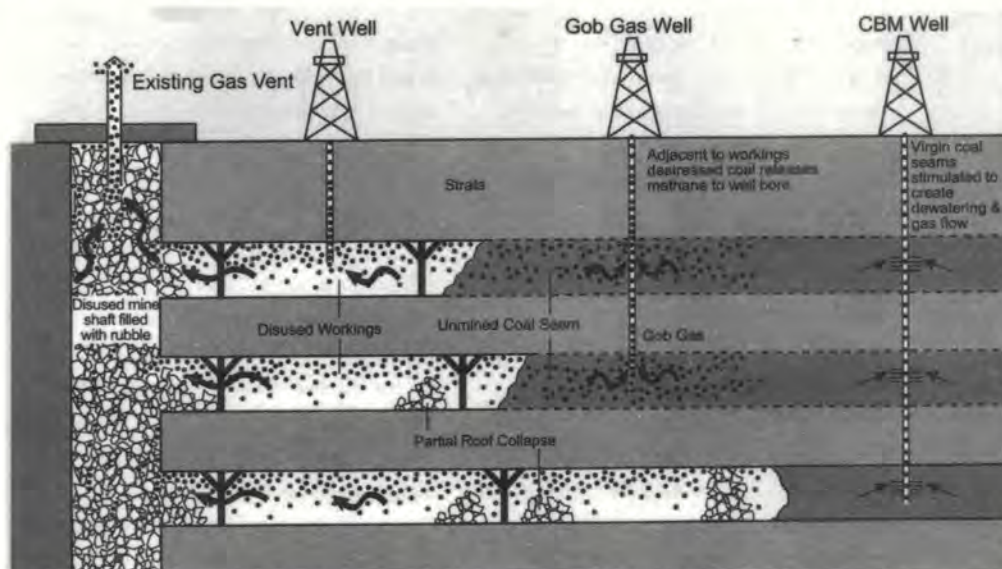
Meanwhile, international energy major Enron is investing

up to £11.5 million in Octagon's CBM programme and has agreed to purchase power generated from its projects over the next 15 years. Octagon has been awarded 11 petroleum

licences for the exploitation of CBM over 21 blocks around the UK covering 2,072 km<sup>2</sup>.

Deutz Energy will supply up to 22 containerised generating sets each powered by one Deutz TBG 620V16K type gas engine rated at 1,358 kW. The 30 MW capacity will be delivered to Octagon over a three-year period. The first units now being built will be installed at Hickleton in South Yorkshire, with the remainder going to other Octagon sites in Yorkshire, South Wales and the north-west.

The modular power stations will be used to provide continuous (base load) power to the national grid. Deutz Energy will be responsible for complete operation and maintenance for a 10-year period.



Coalbed methane can be produced in voids created by mining activity (left), in disturbed and Details from-stressed coal seams ('gob gas', centre) and in virgin coal seams (right)



# Electricity trading the NETA way

by John Chennells, Energy & Utilities Division, Logica

*The introduction of new trading arrangements for the electricity industry – NETA – “will involve a bigger shake-up of the industry than privatisation did”, according to John Chennells. Here, Mr Chennells provides a thorough but understandable description of the new system, which*

*was due to be operational later this month. However, recent delays to end-to-end systems testing mean that NETA will not now be implemented until early next year.*

*John Chennells’ overview is backed up with articles from software and IT solutions providers on pages 11 and 12.*

**W**hen the UK electricity industry was privatised in 1990, the trading arrangements introduced in England and Wales were arguably the most advanced of any electricity market in the world. Based around the concept of the central market or Pool, through which all wholesale trades of electricity had to be carried out, these arrangements have operated successfully for over ten years. During that period, however, Pool arrangements have regularly attracted criticism from a variety of directions, on grounds ranging from the unpredictability of its half-hourly pricing mechanism and the ease with which the mechanism can be manipulated by a small number of market participants, to the fact that the Pool is effectively a ‘closed shop’ in which only physical generators and retailers of electricity are represented. In addition, during the same period the establishment of electricity markets in a number of other countries has led to significant developments in theories as to how best to establish a commodity market in electricity.

As a result of these and a number of other factors, towards the end of 1997 the newly-elected government decided to call for a fundamental review of the UK’s electricity trading arrangements. This process, originally known as the Review of Electricity Trading Arrangements (RETA), produced a series of proposals which are now being implemented as the New Electricity Trading Arrangements (NETA) in England and Wales. And if all goes according to plan, in April 2002 NETA will become BETTA – the British Electricity Trading and Transmission Arrangements – and will be extended to include Scotland in a single UK-wide set of trading arrangements for the first time since the industry was privatised.

In creating a commodity market in electricity, a number of special characteristics of the commodity have to be

addressed. In the first place, it is a commodity which cannot be stored in large quantities – it is not feasible to produce a given unit of electricity on one day and use it the next. The balance of supply and demand has to be managed on an instantaneous basis, and at the same time the overall system frequency and voltage have to be maintained within strict limits. Another special, and almost unique, characteristic is that it is not possible to trace the production of the said unit of electricity through the supply chain from the point of production to the point of consumption. There is, therefore, inevitably an element of approximation involved in deciding who pays whom for the production and supply of each unit of electricity, not least in deciding where and how transmission and distribution losses are paid for.

The Pool-based trading arrangements which were introduced in 1990 addressed a number of these issues by preserving a large measure of overall control of the system in the hands of the newly established National Grid Company (NGC). As the successor to the old Central Electricity Generating Board, the NGC took over control of the transmission network, and also retained responsibility for deciding which units of generating plant should be despatched to meet the system demand. The basic premise was that however much demand there was from end consumers, sufficient generation would always be made available to meet that demand, and the price of that generation would vary accordingly from one half hour to the next. This approach meant that the business of keeping the lights on was predominantly the responsibility of the NGC and the generators, and the involvement of the electricity supply businesses in this respect was effectively limited to ensuring that they

were in a position to pay their Pool bills on time as they received them each day.

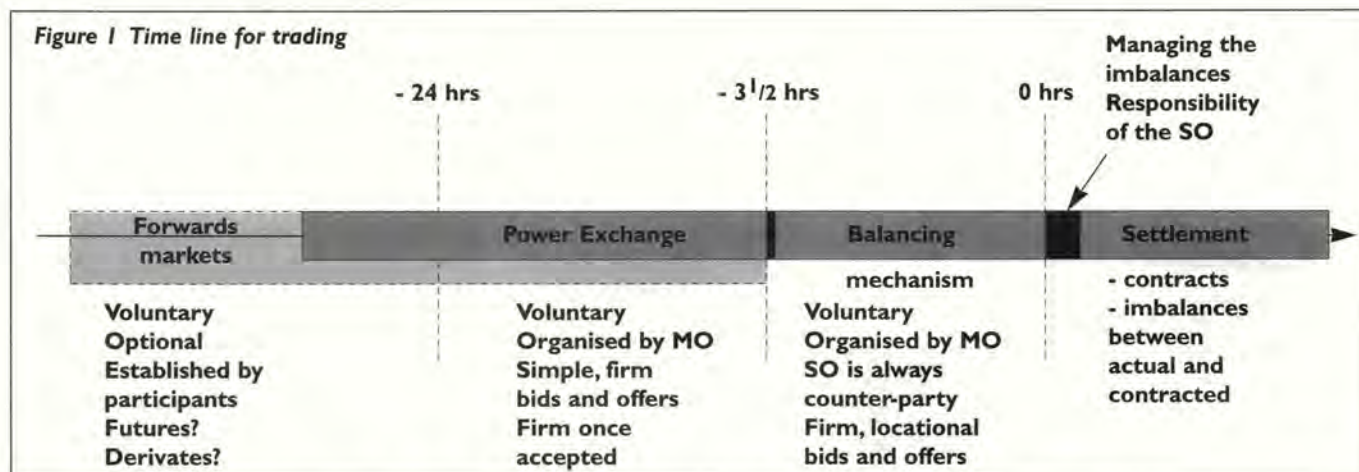
## FROM MANAGED GRID TO MARKET TRADING

The RETA process, and now NETA, has introduced some absolutely fundamental changes to this structure. Indeed, in many respects the changes which NETA brings will involve a bigger shake-up of the industry than privatisation did. In the first instance, immediate responsibility for the management of the great majority of generation is being moved away from the NGC for the first time, and given to the individual generators. It is no longer a requirement for all wholesale trades to be made through the Pool; instead, a series of complementary market mechanisms will be established, and participation in each will be entirely voluntary. What is more, participation will no longer be limited to those organisations which have physical capacity, thus opening up the electricity markets to entry by commodity traders or anyone else who wishes to take part. The extent of the impact which these new participants may make is still a matter for conjecture, but it seems likely that there will be a significant clash of cultures, at least in the early days.

The central NETA Programme, which is being developed jointly by Ofgem and the Department of Trade and Industry, does not prescribe what new voluntary market mechanisms will be, how they will operate, or what types of trade will take place. It is, however, clear that the basis of trading will be the establishment of firm contracts between participants – in the simplest case, between a generator and an electricity supply company. This is a crucially important development for both types of participant, as the existence of the Pool has previously always meant that contracts were non-firm. For the generators, on the



Figure 1 Time line for trading



one hand, the new arrangements mean that they will be required to manage the self-despatch of their plant in accordance with their contractual commitments, as opposed to only generating in accordance with instructions issued by the NGC.

For the electricity supply companies, on the other hand, the requirement for firm contracting means that for the first time they will have to forecast their customers' demand, on a half-hourly basis, to a level of confidence where they can then enter into firm and binding contracts for the provision of that amount of electricity. They will then have to ensure that they do indeed consume that amount of electricity, and (to a first approximation) no more and no less, in each half hour. As the supply companies have, in general, no way of controlling their customers' demand, this establishment of an appropriate contract negotiation and management strategy is going to present them with a major business challenge.

It is to be expected that a significant percentage of the new firm contracts will be negotiated between parties on a private 'over-the-counter' (OTC) basis, as the majority of the former non-firm contracts were. It is reasonable to assume that negotiation of the prices and volumes for these contracts will take place in a broadly comparable fashion to that used in the past for the Pool-based 'contracts for differences'. Additionally, in order to facilitate the expansion of the new markets, a variety of outside trading organisations are expected to start offering a range of standard traded products, either for physical trades or on a purely paper basis. Five or more such organisations have so far declared themselves interested in acting as market operators (MOs), and at least one has already commenced trading electricity futures contracts for the periods immediately before and after the start of NETA. It is also to be

expected that in due course a derivatives market in electricity will also be established, with a full range of instruments being traded as demand for these develops.

Common features of the products to be traded are expected to include standard 'lot' sizes, simple mechanisms for pricing bids and offers, and standard terms and contracts for ease of agreement and settlement. It is likely that many of these products will be traded on a clearing house basis, with each party trading with the clearing house rather than directly with an unknown counter-party, so as to enable trades to be agreed without the need for elaborate procedures to manage counter-party credit risk. This will be particularly important for the trades made in the very short term, from perhaps a day ahead down to only a short while before each half hour period, through what have come to be known as the power exchanges. A power exchange offers screen-based trading, typically of relatively small quantities of electricity over one or more half hours, to enable to participants to fine tune their contract positions by buying or selling up to the last possible moment.

### BIDDING TO THE LAST POSSIBLE MOMENT

Whatever the type of contract struck, for the UK market the 'last possible moment' will occur at a point known as 'gate closure', which will initially take place three and a half hours before the start of each half hour period (see Figure 1). The intention is that interval from gate closure to the start of the half hour period will eventually be reduced as the market becomes more experienced in managing itself, but in the first instance this interval will be used to enable the NGC, as the system operator (SO), to balance the system. In order to enable the NGC to do this, participants will be required to notify their physical positions (either generation or

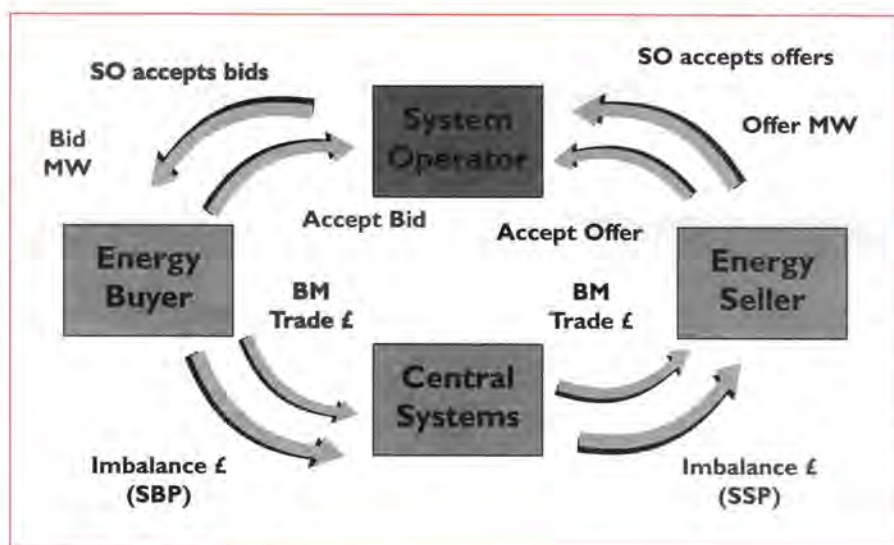
demand) at gate closure, together with their offers and bids to input additional energy to the system or to take energy from the system, respectively. The NGC will then operate this 'balancing mechanism' (BM) by accepting offers and/or bids in order to bring the overall system into balance with the actual out-turn of system demand. Importantly, it can only do this by accepting the offers and bids - in other words, by striking trades with participants - not by issuing despatch instructions as it used to do in the past (though in some senses the acceptances of bids and offers will look very like despatch instructions).

The BM, though, will not be a trading mechanism of last resort in which participants who have failed to optimise their positions by gate closure can make last-minute deals. The BM will exist solely in order to enable the NGC to carry out its primary function of ensuring that the lights stay on.

The operation of the BM will be crucial to the maintenance of system security, as it cannot be expected that the contracts struck by participants in advance of gate closure will be reflected exactly by the subsequent course of events. Quite apart from anything else, occurrences such as extra time in the FA Cup Final, or a solar eclipse, can cause major changes in the pattern or system demand which are extremely difficult to legislate for in advance. It is inevitable, therefore, that in any half hour some (if not all) participants will be 'out of balance' when their actual generation or demand is compared with the corresponding contracted levels.

A new settlement system will be required to manage the financial consequences of the operation of the BM, whereas settlement of trades made in other markets will be the responsibility of the market operators and participants.





**Figure 2 Settlement cash flows**

This system is currently being developed by a consortium led by Logica, which will also operate it. Participants will be required to notify the settlement system of their overall contracted positions at gate closure (in volume terms only - the central systems have no interest in the prices at which external contracts are struck), and all the trades made by the NGC in the BM will also be passed through for settlement. The operation of the settlement system will then take place in two stages; settlement of the trades made in the BM, and settlement of imbalances.

Settlement of trades made in the BM will take place on a basis of paying participants for the energy they supply to the system, either by increasing generation or decreasing demand, for each offer which is accepted by the NGC, at the price quoted by the participant for that offer. Similarly participants will pay for the energy they take from the system, either by increasing demand or reducing generation, for each bid which is accepted by the NGC, again at the price quoted by the participant. If this seems less than intuitively obvious, it should be borne in mind that the payment streams, in either direction, are in addition to whatever other firm contracts the participant has already engaged in. So a participant who has, for example, struck a contract to generate at a price of £20/MWh can bid to the BM at £15/MWh. If this bid is accepted, the participant effectively sells the same energy at £20/MWh under one contract, then buys it back at £15/MWh in the BM. The result is then a profit of £5/MWh for electricity which has not been generated!

Once all the trades in the BM have been settled for a particular half hour, they are then used to set the prices for cashing out imbalances. The weighted average price of all

the offers accepted by the NGC in a half hour becomes the system buy price (SBP) for that half hour, and similarly the average of all the bids accepted becomes the system sell price (SSP). Then for each participant, its contracted generation and consumption (including any bids and offers accepted in the BM) are separately compared with its metered output and consumption. The infrastructure required to collect and aggregate all of the half hourly meter readings required for this each day, from several thousand metering systems, is a major component of the new settlement system.

When the contracted and actual values are compared, participants who have spilt energy on to the system in a particular half hour are paid SSP, for what they have sold to the system. Participants who have taken energy from the system, on the other hand, have to pay SBP for what they have bought (Figure 2). Further levels of calculation claw back profits which would otherwise be made by participants who fail to deliver in accordance with trades made in the BM, and also to charge participants who fail to operate in accordance with the physical positions notified to the NGC at gate closure. The price for this latter calculation (known as 'information imbalance') will in the first instance be set to zero, but will be kept under review if this proves to be a frequent problem. Both non-delivery of contracted energy and information imbalance potentially pose significant operational problems for the NGC, as they mean that remedial action has to be taken at very short notice. It may well be that in the early stages of NETA trading at least, the NGC will have to maintain a significantly higher level of reserve capacity available than has been necessary in the Pool.

## RAMIFICATIONS

When the fundamental proposals for the new arrangements were announced in the summer of 1998, a number of ambitious claims were made as to the benefits which would accrue from the process. It was stated by a variety of sources - some better informed than others - that NETA (or rather RETA, as it then was) would drive down the wholesale price of electricity by up to 25%; that the increase in competition would both attract new participants and make the whole process more efficient than the Pool; that there would be an increase in demand for coal-fired generation, as well as for smaller CHP plant and renewable energy; and that system security would be in no way compromised - the lights would stay on.

As we approach the start of NETA trading (at the time of writing, the exact date is still uncertain), the extent to which any of these objectives will be achieved is impossible to judge. Wholesale electricity prices in the Pool have drifted down by some 10-15% during the last year, so that a further 25% cut seems relatively unlikely - but the overall drop could enable the supply companies to offer a reduction of perhaps 0.5 - 1.0 p/kWh in the tariffs they charge to end consumers. Certainly the number of market participants seems likely to increase significantly, as indicated earlier; but in most other respects it is simply too early to say. What is clear, however, from even such a cursory account as the above, is that the new arrangements will present a series of new business challenges for all the parties involved. One supply company has recently gone into liquidation, for reasons which are nothing whatever to do with NETA; but a number of other electricity companies will be looking anxiously at their preparations for the start of NETA, to satisfy themselves that they have taken adequate precautions to manage the new risks which NETA will bring.

*The views expressed in the above article are my own views and may not necessarily be the same as those of my employer.*

**Contact John Chennells at Logica at: [chennellsj@logica.com](mailto:chennellsj@logica.com)**



## Building Rome in a day: software systems for NETA

**T**he fundamental change to the power generation and supply industry taking place with the introduction of NETA has required fundamentally different technologies to support it. Since the process that led to NETA began in 1998, IT specialists have been extremely busy designing a new generation of software applications to meet the criteria set down by the regulators, Ofgem, working in conjunction with the system operator, the National Grid Company (NGC).

With go-live just weeks away, these applications are now passing through their final testing procedures. The challenge has been to produce software from scratch and against incredibly tight deadlines – something akin to building Rome in a day, as one technology company MD put it.

Not only that, but the development environment has been one of constantly changing specifications. It is worth remembering that the UK's approach to reforming the power industry is unique, indeed pioneering with no blueprint to follow, and the rest of the world is taking notes.

One company that supplies the power industry with software to operate under NETA is ICIS Technology. The company produces a suite of NETA compatible programs called 'Panacea' that has taken over forty man-years to develop.

### DIFFERENCES

Asked about the key differences between NETA and the soon-to-disappear Pool system, ICIS Technology's Technical Director Trevor Drawbridge put it simply: "Trading, trading, trading! By this I mean trading closer to the line, trading later, and trading more."

NETA's market-based model required systems that mirror those used to trade commodities like oil and gas. This necessitated flexible software with real-time measurement at its core.

One company installing 'Panacea' is American giant, NRG, who recently acquired National Power's 680 MW plant at Killingholme in Lincolnshire. NRG bought the power station with no trading

staff but quickly established a trading capability on site and is establishing a trading group in London. Claire Andrew, Risk & Regulation Controller at NRG, reiterated that NETA represents a sea-change for the whole industry: "Real-time operation is a major change to our trading activities. To make the most of opportunities under the new trading arrangements, software must allow us to analyse our position at any given time and make judgements based on real-time data. This was not really required under the Pool system, but is now essential to obtain a competitive advantage and to maximise profitability," she said.

### OPPORTUNITIES

NETA software will help generators maximise these opportunities. Electronic communication means instant information exchange to enable quicker reaction to problems and opportunities. For example, a direct interface to the system operator (NGC) allows generators to see the acceptance of bids or offers placed in the lucrative Balancing Mechanism via trading software. These acceptances together with load change instructions from an Energy Management Centre can then be displayed, allowing the generator to plan load changes in good time.

There are also benefits relating to more accurate asset availability forecasts. For example, some systems provide a link between a power station and the Meteorological Office for weather and climate updates. When matched against the plant's own constraints and variables like the type of fuel used etc, total capability can be forecast. When this type of information is aggregated and updated in real-time, the software becomes a very accurate tool in letting users know if they can respond profitably to fulfil extra demand. Trading closer to the line in this way maximises revenue and reduces risk.

Balancing contract positions with actual generation will be key to maximising profit. Software will calculate every half-hour, in real-time, how much energy has been generated compared to projected targets. It will then advise at what level to generate

in order to avoid costly imbalance charges imposed in the balancing mechanism. This differs from the Pool system that had no financial penalties for over/under generation, just a verbal 'slap on the wrists'.

### FLEXIBILITY

NETA makes demands on generators to be more flexible and responsive to demand in an effort to bring efficiency and cost savings to the electricity industry. This is reflected in the software available that is configurable to satisfy specific needs.

ICIS Technology chose Microsoft's Windows NT operating system for Panacea because of its familiarity amongst users and the ability to adapt screen layouts according to preference. On-line updates and self-healing systems are in place to anticipate changes in the future whilst the major software suppliers have set up 24-hour helplines and specialist training and support divisions to cater for any teething problems.

Trevor Drawbridge adds: "Anyone in the business of tracking the development of NETA will have noticed how important flexibility is – ours is a constantly changing environment and this will continue as NETA develops post go-live."

### WINNERS AND LOSERS

With the emphasis on greater competition in the electricity market under NETA, there are bound to be winners and losers. And these are likely to be determined by how quickly generators grasp the new reality and how effectively they utilise the new systems to deliver accurate information rapidly to trading desks. It is worth remembering the human element: at the end of the day it is people who will be making the final decision on trades, but the quality of their judgement will be based on the accurate and timely data produced by the software and IT systems they have installed.

**Contact Isabel Mountford at ICIS Technology, tel: 01423 524192, e-mail: [isabel@icistechnology.co.uk](mailto:isabel@icistechnology.co.uk)**



# Preparing for NETA – IT solutions

One certain winner with NETA is the software industry, as electricity companies acquire new trading capabilities.

## Switching on the suppliers

**A** group of ten public electricity suppliers (PESs) have confirmed that they have completed acceptance testing of a key back-office system in readiness for the new electricity trading arrangements (NETA) programme.

IT solutions and services provider Mi Services Group has partnered with St Clements Services to deliver a new solution, named SONET. The group of ten PESs comprises ScottishPower, Manweb, Scottish Hydro Electric, Southern Energy, npower, Seeboard, London Electricity, SWEB, Norweb and Northern Electric.

The key function of the new systems will be to allow NETA participants to validate the value of electricity to be traded under the new arrangements.

St Clements Services considered bids from several leading IT services and solutions providers and selected Mi Services Group for its understanding of the business issues and for its proven expertise in implementing Oracle-based e-business solutions.

**Contact Neil Ratcliffe at Mi Services Group, tel: 0191 516 3000, e-mail: [neil.ratcliffe@mi-services.com](mailto:neil.ratcliffe@mi-services.com)**



Ten electricity suppliers will use the SONET system

## CCGT chooses ABB solution

**R**egional Power Generators (RPG) has selected ABB Energy Information Systems to supply NETA compliant trading systems for its 272 MW Glanford Brigg CCGT power station at Brigg, North Lincolnshire. The ABB genesisplus system, which replaces an existing ABB trading solution with which RPG traded Brigg into the England and Wales Pool, was delivered in September.

This latest order brings the total number of UK power stations contracted to use the ABB genesisplus suite to eight.

As well as the four core genesisplus modules – administration, operations manager, contract volume notifier and settlement – covering the mandatory areas of NETA, RPG has ordered energy balancer, generation monitor and fuel manager modules.

The new systems will allow RPG to make more commercially advantageous bids/offers, monitor station output better, and manage fuel contracts.

**Contact ABB Energy Information Systems Ltd at tel: 01252 732100, e-mail: [energyplussolutions@gb.abb.com](mailto:energyplussolutions@gb.abb.com)**

## Managing risk is the key

**T**he introduction of NETA will bring about the need for greater risk management for UK utilities companies. Colin Cooper, Principal Consultant in the Energy and Utilities Sector at Cap Gemini Ernst & Young, believes that effective risk control is critical for companies operating under NETA.

Cooper believes that utilities companies need to forecast and manage their risk and potential demand to ensure that they buy what they want, at the best price, for their customers.

- Trading and risk management will be essential for success in the new competitive markets: it is crucial that unmanageable uncertainty is replaced with manageable risk.
- Utilities companies cannot predict the future. As competition develops, both buyers and sellers will exert their freedom of choice and as a result, uncertainty regarding supply and demand will be created.
- How utilities manage the new trading environment will be key to their long-term viability and the profitability of their business. First and foremost, utilities companies need to understand the importance of accurate demand forecasting.
- There will be winners and losers in what is for many an alien world. The more aggressive traders will set the pace and those who are not prepared will find it difficult to survive in the market as it becomes more and more competitive.
- UK energy companies require new skills to cope with the restructuring of the market and the prospect of commodity trading. 'TradingPlus' was launched by Cap Gemini Ernst & Young to help utilities companies prepare for and operate in the new uncertain marketplace. It is designed to enable utilities companies to set up trading activities, enabling them to remain competitive and manage risk in the new single energy market.

**Visit the Cap Gemini Ernst & Young website at [www.cgey.com](http://www.cgey.com)**



## Fuel cell energy storage plant for Little Barford

**I**nnogy, the UK business of National Power, has announced agreements to bring its 'Regenesys' energy storage technology to both sides of the Atlantic.

Under the terms of its agreement with National Grid Company in the UK, Innogy expects to provide the UK's first fuel cell energy storage capability - alongside a combined cycle gas turbine station - to maintain supplies to the grid in the event of system failure. The company has also signed an agreement with US Utility Tennessee Valley Authority (TVA) that could lead to the construction of the first Regenesys plant in North America.

Currently in its early stage of development (and profiled in *Energy World* Nov/Dec 99 issue), this energy storage technology may offer utilities:

- an alternative to using power stations to ensure security of supply at times of peak demand,
- better use of the cleanest generating plant by reducing the need for less efficient peaking plant,
- the ability to enhance the flexibility and reliability of renewable sources of energy, and



*Artist's impression of the energy storage plant*

- the potential to provide balancing services to the grid system including frequency response, reserve and voltage support.

Regenesys has been tested at Innogy's Aberthaw power station in South Wales since 1996, and the first utility-scale commercial plant is now ready for construction. Subject to the usual consents, the UK plant will be built at Little Barford in Cambridgeshire, adjacent to Innogy's CCGT power station.

Developed by an international team led by British scientists and engineers, the

electro-chemical process operates like a giant rechargeable battery: it can store electricity when demand and costs are low, and can release energy quickly when it is needed to meet demand.

The Little Barford plant is designed to be capable of storing 120 MWh of electricity and will be able to speedily provide 15 MW of power. It is intended that the new installation will serve as the source of back-up supplies to enable Little Barford power station to provide a black start capability to the grid system.

## Radio frequency heating breakthrough

**U**K energy specialist EA Technology has achieved a breakthrough in the use of radio frequency (RF) heating, to shape plastic and rubber components more efficiently, faster and with lower power consumption than existing processes. Called RF Forming, the technology offers major advantages to manufacturers who mould products for the automotive, packaging, medical, aerospace and electrical

goods sectors.

Instead of the conventional method of heating the surface of polymers in a press, RF heats the whole component volumetrically. The technique is much faster than conventional methods, eliminates localised overheating and is highly energy-efficient, according to EA.

"Our breakthrough is the development of new RF power generators which can be

tuned to provide the exact amounts of power required to form a wide variety of components, using many different plastics and rubbers," said Michael Colley, EA Technology's process engineering manager.

Trials on a typical RF Forming installation developed by EA Technology have shown that the temperature of polymer components can be raised to around 120°C in less than 15 seconds, with applied power of only 300 W.

## Power refurbishment for Tbilisi

**U**K contractor Black & Veatch (B&V) has established a project team in Tbilisi, the capital city of the Republic of Georgia, as part of a contract to revitalise the power distribution system to the city, and to plan and supervise the installation of electricity meters to Tbilisians.

AES Silk Road, one of the world's largest independent power producers,

called in B&V in January last year following the acquisition of Tbilisi's electricity distribution company, which provides electricity to some 350,000 households and 25,000 commercial customers. B&V was appointed to provide engineering solutions to technical and operational problems associated with a distribution system with a rated capacity of 800 MW.

Among the tasks to be undertaken were the rehabilitation of the distribution network from 132 kV to a household's meter; the design of a billing system; the provision of IT training and business support; and the deployment of a team in Georgia to design and install meters in all domestic and commercial premises.



# An enquiry into the future

Malcolm C Grimston and Peter Beck, Royal Institute of International Affairs

*Is the expanded use of nuclear power an essential ingredient to tackling reducing carbon dioxide emissions and thus tackling climate change? Who knows? And despite a good deal of material on the subject published in Energy World in the last year or so, we are a long way from an answer.*

*Recognising both the importance of the question and the difficulties involved in answering it, the Royal Institute*

*of International Affairs has established an 'enquiry into the future of civil nuclear energy'. Here, in an edited version of a paper originally presented at the Uranium Institute's 25th Annual Symposium in London in September, enquirers Malcolm C Grimston and Peter Beck explain the background to the enquiry, and give some findings from phase 1.*

**T**he issue of nuclear power has for some time, at least until relatively recently, been conspicuous by its absence from serious debates about the future of energy and, especially, the global climate. There has been something of a policy paralysis in many (but by no means all) countries. In such countries, no new nuclear power stations have been built, radioactive waste has accumulated, and the body of nuclear expertise and construction capability has dissipated.

This has not been because there are coherent non-nuclear strategies to address future problems of energy supply and greenhouse gas emission reductions. Rather, it is because it appears too difficult to take the decisions on nuclear power which would be necessary to overcome some of its unattractive features (especially its high capital intensity) and allow it to compete more fairly with other sources of energy.

Though there may be many reasons for this, it looks likely that one of them is the polarised nature of the debate, something it shares with other issues such as genetically modified food (with similar consequences).

Whatever the truth, in the absence of a source of reliable and objective information the temptation to duck decisions in highly controversial fields is a strong one. Yet, with the admirable exceptions of a number of impressive reports from independent institutions such as the Royal Society and the Royal Academy of Engineering in the UK, such information is hard to come by.

With these observations in mind, and following on a more general study of the subject in 1994, the Royal Institute of International Affairs (RIIA) set up an *Enquiry into the Future of Nuclear Energy*. It consists of two phases.

Phase 1 of the project began in

October 1999 and concluded in September 2000. Its aims have been to define and provide an understanding of the main areas of agreement and dispute within the nuclear field; to identify which of these have been relatively well researched and those which have been relatively neglected; and to propose a programme of research for Phase 2.

A wide range of opinions was received, from different positions on the pro- to anti-nuclear spectrum and from different countries. The results will be published in a position paper, which will seek to present pro- and anti-nuclear views side by side and provide an accompanying commentary. This approach to presenting different views may be unique in the field.

## THE MAIN ISSUES

The project has considered three groups of issues. The first group consists of relevant issues which are largely outside the control of the nuclear industry, but which serve as the 'environment' in which the nuclear industry must operate. It includes:

- energy demand and choices;
- climate change;
- health effects of low levels of radiation;
- regulatory issues.

The second group consists of those over which the nuclear industry has a major influence. Such issues include:

- the economic attractiveness of nuclear power;
- nuclear research and development;
- safety of nuclear facilities;
- infrastructure necessary to preserve the nuclear option;
- skills requirements in the case of nuclear phase-out.

The third group consists of issues over which the nuclear industry has some but

not complete control. It includes:

- nuclear proliferation;
- public perceptions/politics;
- waste management;
- reprocessing.

Of course, these categories do not have sharply defined edges and their effects can interact. The availability of nuclear power might have an effect on overall energy demand, while the costs of nuclear power will certainly be affected by the stance taken by regulators. Nonetheless, if only as an organisational tool, these categories have been helpful to the authors.

Limitations of space prevent a full catalogue of the findings of the preliminary studies here. However, three areas may serve as examples.

## KEEPING THE OPTION OPEN

It is almost a truism to say that the nuclear option should be kept open in case future generations view nuclear expansion as the best option. It is certainly hard to argue that this generation should, or even that this generation could, entirely prevent the people of, say, 2050 undertaking a major nuclear programme.

However, the oft-used phrase 'keeping the nuclear option open' is a difficult one to quantify. First, it is not clear what it means. To some, it seems to mean early orders of new nuclear plants in advance of market demand, in order to safeguard the skills necessary for such projects. By definition, this would require considerable action by governments, either in providing the capital for such investment or ensuring the existence of a guaranteed market for the output of such nuclear stations, probably at guaranteed prices. To others, the nuclear option will never close. The existence of records of nuclear science means that a



# of civil nuclear energy

restart using current technology will always be possible, even if nuclear technology should become moribund for some years.

The question then arises, 'open to do what?'. For example, the requirements of a nuclear industry of approximately the current size, based largely on replacement of existing capacity or perhaps of slow growth, might be radically different from the requirements of a nuclear industry say ten times the current size.

a scenario for some time without a requirement for reprocessing of spent fuel. However, even here it is likely that a considerable amount of preparation, including R&D, would be necessary. Key requirements might include:

- development of a wider range of reactor designs, to include smaller plants with lower capital outlay and shorter construction phases more suited to competitive electricity supply

nuclear power is subject to active antipathy among the general public in many countries. It is less clear why this impression has arisen, however. For example, opinion polling carried out by MORI in the UK in 1999 suggested an interesting relationship between public perceptions, and the perceptions of those perceptions among decision-makers (see Table). These data imply that at least in some countries the perception of public opinion among decision-makers may not be accurate,

	Favourable towards nuclear energy	Unfavourable towards nuclear energy	Neither favourable nor unfavourable or don't know
Public opinion	28%	25%	47%
All Members of Parliament (MPs)	43%	44%	13%
MPs' perception of national public opinion	2%	84%	14%

## Results of MORI opinion polling in the UK in 1999

It may be fruitful to consider three simple scenarios for the future of nuclear power in, say, 2050:

- Red - slow withdrawal from nuclear power as existing plants reach the end of their lifetimes in the developed world and as developing countries find alternatives to currently planned nuclear expansion leading to effectively zero capacity in the second half of the 21st century.
- Amber - continuation of the present situation, including replacement of existing reactors, some new capacity in developing regions, resulting in modest growth of capacity towards 600 GWe, representing some 2% to 5% of global primary energy demand.
- Green - a major expansion to some ten times current capacity in the second half of the century, representing perhaps 15% to 30% of global primary energy demand.

In the Red scenario 'keeping the option open' involves no more than preservation of sufficient skills to deal with the legacy of nuclear waste, facilities to be decommissioned, decontamination of land, etc.

In the Amber scenario a continuation of present policy might be sufficient, with new reactor designs being based largely on existing concepts. It is likely that there would be sufficient uranium to sustain such

markets and possibly some developing countries, as well as large plants for more centralised systems;

- significant progress on management of waste;
- more sophisticated methods of decision-making that can engage and involve local communities and other interest groups.

To be ready to respond to the Green scenario it is likely that considerable effort would have to be expended in the near future. For example, a major nuclear expansion might require, in addition to likely needs for the Amber scenario, any or all of the following:

- new approaches to reprocessing;
- plutonium powered reactors;
- plutonium producing reactors;
- partition and transmutation as an approach to managing spent fuel;
- methods of extracting uranium from seawater;
- use of thorium.

A considerable research and development effort may be required to ensure that a suite of techniques is available that would allow suitable responses to Red, Amber and Green scenarios.

## PUBLIC PERCEPTIONS AND DECISION-MAKING PROCESSES

It seems to be common currency that

perhaps being driven by the activities of pressure groups and by generally anti-nuclear popular media.

However, generalised public opinions are only one aspect of the issue. Attention is turning more to the attitudes of certain key groups, notably local communities, when nuclear projects are proposed. It is clear that the old 'decide-announce-defend' (DAD) model of decision-making has become increasingly discredited in many countries. Building legitimacy and consensus around specific decisions and programmes is increasingly important, at least in some countries.

It is a truism to say that continued operation of the nuclear industry, let alone expansion, will require new facilities to be built as existing plants are closed down. Although current plant economics in countries such as the USA have improved to the extent that lifetime extension is now much advocated, there will come a time when it is no longer economic to refurbish an existing nuclear plant, and new capacity of some kind will have to be ordered.

There has been an increasing trend in some countries, notably Canada, the UK and Germany, for protestors to take part in direct action, sometimes of a violent nature, against specific proposals or facilities in areas such as road building, luxury home development, logging, animal



experimentation and nuclear transport. Such actions often extend to individual workers or company directors in an attempt, often successful, to intimidate them into abandoning the plans in question.

Even in the absence of such more extreme actions, local communities have proved themselves increasingly adept at building consensus against unpopular projects, even (or perhaps especially) if these projects have a national or federal dimension. The use of political actions involving local politicians has become more prevalent, often coupled with sophisticated local campaigns which make it difficult for opposing views to be expressed.

Over recent years considerable work has been done in an attempt to develop innovative ways of ensuring more involvement from potentially affected communities and society at large in such decisions. Such work - it is sometimes referred to as a 'stakeholder' approach - has included citizens' panels, consensus conferences and stakeholder dialogues, in some cases building on experience of well-established local liaison committees. Ways of using the planning process so that any development would benefit local communities are also being explored.

An adjunct is the necessity for the decision-making process itself on the part of industry and government to become more open, and to involve groups other than the technical experts at an early stage of discussion. The ultimate aim should be to foster 'consent', not merely 'acceptance', among potentially affected communities. This is an area where more work could prove very fruitful.

### **THE RELATIVE ECONOMICS OF NUCLEAR POWER**

It would seem obvious that, although matters such as public perception and waste management will be of key importance in determining the future of nuclear power, nobody will wish to build nuclear stations unless there is a product which is attractive to decision-makers, particularly in the capital markets.

Energy demand in the developed world is not expected to grow at high rates in

the future. Although the share of electricity within the general energy mix is expected to increase, many developed countries have something of an over-capacity of electricity plant at present. Demand for new plant may therefore be modest in the foreseeable future and may be limited largely to replacement capacity.

In the 1970s decision-making about new nuclear stations and other generating plants lay fundamentally with governments, and with government-appointed regulators. Even in some countries in which nuclear stations were in the private sector, such as Japan, governments regarded it as their role to ensure that strategic forms of electricity production were constructed as a hedge against future increases in hydrocarbon fuel prices or interruptions in availability. Governments offered utilities a highly regulated local geographical monopoly, thereby creating a guaranteed long-term market for their output. As a result, they could invest in highly capital intensive forms of electricity production (with the approval of regulators), knowing that the investment could be recouped from captive customers over a long period of time. Especially in the USA, nuclear power was regarded as being the cheapest option available.

The easing of the world hydrocarbon fuel situation through the 1980s (and in particular the discovery of enormous reserves of natural gas), the development of the combined cycle gas turbine (CCGT) with its high thermal efficiency and lower costs, and perhaps the influence of changing political fashion, led both to a reduction in the costs of fossil-fuel generated electricity and to the liberalisation of electricity supply systems in many developed countries.

As a result, the companies competing to generate electricity have become more concerned with short-term returns on capital. Reduction of economic risk has assumed a high priority. Gas-fired capacity has become the preferred option, mainly because of its low capital costs but also because of lower perceived overall ('levelised') costs; longer term sources such as coal and nuclear power have fallen out of favour. Gas, where available, has also faced less public resistance in some countries.

No nuclear order placed in the USA since 1977 has been completed, and the building of nuclear stations and the ordering of new nuclear capacity in the European Union has halted, with the possible exception of France.

A further effect of liberalisation has been to promote the attractiveness of smaller generating units, of a few hundred megawatts or smaller, over the 1000 MW plus units typical of the 1970s. However, some large gas-fired units, requiring relatively low capital outlay, are still being ordered.

Large units face problems both over raising capital, and over matching changing loads in markets increasingly characterised by a large number of small generating units. At present there is no up-to-date proven nuclear power design of capacity below about 500 MW. Both renewables and small-scale gas turbines, including combined heat and power (CHP) stations, may be better suited to a market in which an increasing fraction of the total load comprises large numbers of small users rather than a relatively small number of large customers such as, in the UK, the former regional electricity boards. As the average unit size falls, so it will become more difficult to manage large units coming on- and off-load, for example for maintenance. The likely growth of small, largely self-contained local grid connections may exacerbate this development.

This being said, it remains an open question as to the extent that baseload will still be required even in liberalised electricity markets; in less liberalised markets baseload is likely to remain very important. Large nuclear units may well remain attractive in countries such as France and Japan as well as in several developing and newly developed countries where electricity demand is growing at a fast rate. Further, liberalisation has brought to bear downward pressures on the costs of operating existing nuclear plants, pressures that tend to be absent or much smaller in centrally controlled economies without competition.

A return to a more centralised model of electricity markets, perhaps because of resurgent fears about global energy security, or because market instruments fail to deliver sufficient reductions in greenhouse gas emissions, or because liberalised



markets prove incapable of ensuring security of electricity supply on an hour-by-hour basis, might lead to a renaissance in large plants in other developed countries. Alternatively, liberalisation may proceed further in countries where it is still relatively less advanced. Either of these trends might lead to a narrowing of the gaps between policy in various developed countries. It is however perfectly possible that major differences in nuclear policy between developed countries might persist.

Growing concerns about the environment, and especially about climate change, are leading to a reassessment of energy policy. It seems likely that a variety of market instruments to internalise the economic costs of emissions of pollutants such as carbon dioxide will be introduced, including perhaps pollution taxes (or its less efficient surrogate, energy taxation), tradable emission permits, and schemes whereby investment in pollution-saving devices in other countries can generate credits for companies carrying out such investment (known in the Kyoto Protocol as Joint Implementation and the Clean Development Mechanism).

Certain measures have already been introduced in some countries, eg Norway. Such mechanisms would improve the economics of nuclear power and of renewable methods of electricity generation relative to that of the fossil fuels. Pollution taxation might however do little to overcome the inherent economic risk associated with large-scale highly capital intensive projects; smaller reactor models, some of which are in an advanced state of design, may still be required in some markets.

At present the richest 20% of the world's population use 55% of the world's energy, while the poorest 20% use only 5%. Although it is unlikely that such disparities will disappear rapidly, most of the expected growth in world energy (and especially electricity) demand over the next decades will almost certainly be in countries which are at present relatively undeveloped.

The situation in many developing countries is rather different from that in the developed market economies. In many countries of the Asia-Pacific, for example,

demand for energy continues to grow rapidly, but access to plentiful gas reserves is, for the present at least, limited. As a result, several countries, such as China, India and South Korea (as well as Japan), remain publicly committed to the large scale development of nuclear power in the immediate future. Significant energy growth is also expected in Africa and South America, where (with the exceptions of South Africa, Brazil and Argentina) nuclear power is not at present used.

These economies retain a degree of central control, which makes raising capital for large-scale schemes less problematic than in the more market-oriented systems. Further, the rate at which energy (and especially electricity) demand has been growing, for example in China, has made it seem unlikely that any single source of electricity can expand sufficiently rapidly to fulfil this demand.

However, questions remain over the suitability of nuclear power for some developing nations. Capital is often a constraining factor, especially in view of the current unwillingness of many world financial institutions to lend money for nuclear projects. Large capacity plants, such as modern nuclear stations, require a major grid infrastructure to be effective. It is argued that the technical complexities of nuclear science and technology compared to lower-technology fuels would offer challenges to the engineering infrastructure of some developing (and indeed developed) countries, although such countries have proved quite able to handle many complex technologies such as aviation.

Voices within the former Soviet Union also talk of a renaissance in nuclear construction, both the completion of suspended projects, such as Rivne-4 and Khmel'nitskiy-2 in the Ukraine, and new plants. However, the situation within the region is a volatile one.

It is possible, then, to envisage one future in which some countries, perhaps those which retain a more regulated electricity supply industry, will continue to develop their nuclear industries, while nuclear power construction in some

countries with more market-led electricity supply may be limited to replacement capacity, or perhaps not even to that.

## CONCLUSIONS

Despite the assumptions of many, the future is an unknowable region. The key for the present generation must be to ensure sufficient flexibility is available to future generations so that they can respond to whatever circumstances in which they find themselves. It is easy to envisage futures in which nuclear power will not be 'needed' and others in which it will - or to be more precise, futures in which nuclear power will be a net problem or a net benefit.

The present diversity in attitudes to nuclear power in different regions may persist or even widen. We must plan towards as many of these possible futures as possible. The long timescales involved in energy supply mean that decisions taken - or not taken - today will have implications several decades into the future.

This means that the nuclear option should in some sense remain open. That in turn means that it must be acceptable to the public and to decision-makers; that its economics must be favourable; that a workable and acceptable approach to waste management must be in place; and that novel reactor designs are developed to address current problems.

The RIIA Enquiry has as its central aim quantifying the question: 'What is necessary to keep the nuclear option open?' It also aims to provide a base of balanced and reliable information for decision-makers. Already there are clear signs that nuclear power is returning to the international political agenda in response to concerns about climate change. For this return to consideration to lead to good decision-making in the near future, impartial information will be essential. Phase I of the project has made a start on producing a source of such information. It has also helped the authors in their analysis of the principle issues, and has pointed the way to the more detailed work of the next stage.

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# Creating an environment for

*Already well-known for its research into renewable energy and sustainable buildings, Nottingham University's School of the Built Environment has added two unique new facilities on the University Park – to allow students to experience renewable energy as they work and rest.*

**H**ead of School Professor Saffa Riffat foresaw the need for both more teaching and research accommodation as student numbers started to grow. He particularly wanted to be able to demonstrate renewables technology to students, so made an offer to the University Estates Department to raise the difference in price between conventional buildings and facilities which could be used to demonstrate sustainability. In the end, both buildings benefited from major private sector financial input.

The results were the Marmont Centre for Renewable Energy, a research facility for existing and new renewables technologies; and the David Wilson Millennium Eco-House, a four bedroom home for post-graduate students. Both buildings incorporate some of the technologies studied at the School, and both incorporate facilities to bolt-on new devices for testing purposes.

Both buildings fit within the School's philosophy of working with 'real world' or near-to-market renewable and building services, technologies rather than more distant possibilities. The buildings will work as a test bed for some of the systems developed at the School.

Being opened this autumn, the new buildings follow the opening last year of a major extension to the University, the £50 million Jubilee Campus, which also incorporates a range of innovative and sustainable technologies.

The School is keen to work with industry to see its work carried forward into

production. Its 'desert' cooler system, a cheap, environmentally-benign air conditioning system for buildings, has recently been licensed to a local company for manufacture.

The School of the Built Environment now runs an MSc degree course in renewable energy and architecture, and an MEng degree in architecture and environmental design. The University is currently exploring Institute of Energy accreditation for these.

## MARMONT CENTRE FOR RENEWABLE ENERGY

Sponsored by Beacon Energy Ltd to the tune of £290,000, the new teaching facility and research laboratory is dedicated to the investigation into and dissemination of emerging renewable energy technologies. The building contains an high specification environmental chamber which has a full range of facilities for controlling indoor air conditions, including temperature, humidity, air change rate. The chamber is unusual in having a full height glazed wall to allow the effect of solar heat gain and solar lighting to be assessed.

The Centre is equipped with a multipurpose roof for flexibility in mounting and replacing equipment to test and monitor. Already installed are: a large array of thin-film PV collectors, thermal solar collectors, a rainwater collection system and several light pipes. The Centre also has a wind turbine installed at the roof level for investigation of wind-powered renewable technologies such as dynamic insulation, a rainwater recycling system and a ground sourced heat pump.

Two particular areas which the School is focusing on at the moment – reducing the cost of drilling boreholes for ground sourced heat pumps, and heat pumps generally – will both benefit from the new facilities.

## ECO-ENERGY HOUSE

The Eco-Energy House is a four-bedroom detached dwelling of brick and block construction made possible by funds donated by local housebuilder David Wilson Homes Ltd. The purpose of the project is to investigate the integration of



*The south-facing side of the new Centre for Renewable Energy – note large available roof space*

established renewable energy technologies, so the house will be occupied to provide realistic load conditions and user feedback. Systems included comprise roof-tile integrated photovoltaic cells, solar collectors for hot water, a solar-assisted ventilation stack and light pipes. Energy storage tests will be carried out on under-floor heating/storage systems and solar collector. A water recycling system is also installed in order to develop the use of recycled 'greywater' for drinking.

Students had yet to move in at the time of the visit, and the interior of the house resembled a pristine show house from a commercial housing estate, rather than typical student accommodation. Mature postgraduate students will be the lucky occupants – perhaps the experiment might not work so well with typical undergrads.

## JUBILEE CAMPUS

The £50 million new campus has been constructed on a former industrial site within a mile of the existing University Campus. It was the intention of the University to make the new campus a model sustainable building for the Midlands,



*Evacuated tube solar hot water collectors fitted to the Eco-Energy House*



# learning at Nottingham

as well as setting an example to the large number of students passing through. The project is of unique value as regards encouraging environmental awareness and demonstrating state-of-the-art civic solutions. Principal innovative features of this EU funded demonstration project are the mixed-mode ventilation system, tracking wind cowl, photovoltaics integrated into the atrium glazed roof and passive comfort cooling in summer.

Perhaps the most significant innovation is the PV-driven heat recovery mechanical ventilation system, which uses corridors as return ducting. Air is fed to stairwells, at the top of which are wind cowls which rotate away from the wind, helping the exhaust of stale air.

The philosophy is to use good passive

design to minimise energy loads – these can then be supplied largely from renewable sources.

It is estimated that the building should achieve reduction in energy consumption of around 30% on gas and 60% on electricity when compared to a model good practice office building completed in the early 1990s. Designed by Arup, the project was funded by the EU Thermie Programme.

**Contact the Head of the School,  
Professor Riffat on tel: 0115 951 3158,**



**The Eco-Energy House, with passive ventilation stack, light pipes, and both PV and solar thermal collectors**

**e-mail: [safa.riffat@nottingham.ac.uk](mailto:safa.riffat@nottingham.ac.uk)  
Or Business Development Officer Trevor  
Wright on tel: 0115 846 6040, e-mail:  
[trevor.wright@nottingham.ac.uk](mailto:trevor.wright@nottingham.ac.uk)**

## Research underway at Nottingham

The range of externally funded research into renewable and sustainable energy at the School of the Built Environment is broadly classified into three categories:

- renewable energy-driven building services,
- sustainable building services, and
- natural ventilation, indoor air quality and urban air pollution.

In the first category, research has been carried out into novel space heating and cooling technologies, such as ground-source and solar-energy driven heat pumps, a PV driven fan system, a milkfloat cooling system, a solar louvre system, ceramic evaporative cooling, wind-driven ventilation systems, solar thermoelectric coolers and hybrid solar/gas systems.

Integration of renewable technologies is vital for their acceptance by building users and owners, and the School has won several grants to study systems for lighting, ventilation and heating. The School is also carrying out several investigations into novel solar technologies including high efficiency membrane solar collectors and fluidised, phase change material glazed energy storage systems. Other projects in this category include measurement and

modelling of daylighting devices, miniature CHP systems and heat pipe/ejector cycles for cooling applications. In addition, a thermal diode wall system is being investigated which employs heat pipes in two-leaf walls to allow solar heat to be transmitted in one direction. Combined with appropriate control, this system would maximise solar heat gain in winter and minimise it in summer.

In the second category of sustainable building services the School has conducted research into sustainable technologies for heating and cooling including chilled ceilings powered by cooling towers, desiccant cooling systems, a continuous absorption-recompression system, rotary heat pumps, chemical storage heat pumps, a night-time cooling system utilising phase change materials and heat pipes and ejector powered absorption-recompression cooling systems. Sustainable technology developed at the School includes a novel ventilation/heat recovery system based on a fibre impeller fan system, tracer-gas techniques for accurate airflow measurement in ventilation systems, and new methods for determination of k-factors for energy efficient operation of

HVAC systems. The School has also investigated refrigeration and air conditioning systems using waste heat.

The third category of research concerns natural ventilation and indoor air quality. The School has obtained funding from the EU to investigate heat recovery in natural ventilation systems using heat-pipes. An EPSRC funded research project focuses on the effect of unsteady airflow in naturally-ventilated buildings. This theoretical, computational and experimental work produced some highly acclaimed papers in natural ventilation. The School is also investigating wind-powered dynamic insulation for naturally-ventilated buildings which would significantly reduce the heat loss through the building fabric and also improve indoor air quality. The School has won a number of grants for studying air pollution and indoor air quality in the urban environment. These include an investigation of movement and deposition of aerosol particles in buildings, the dispersion and transmission of traffic pollution in and around buildings, and the use of mop fans for removal of gaseous and particulate pollutants.



# Chemicals manufacturer scoops Kyoto award

*Transco and the Major Energy Users' Council (MEUC) presented their first annual Environmental Awards in September at the MEUC's annual autumn luncheon in London. Five categories of Awards were established to recognise and reward companies, organisations and individuals that significantly increase energy efficiency and reduce greenhouse emissions and other waste materials.*

**T**he overall winner – of the Kyoto Cup – was AH Marks, a privately-owned chemical company which has 20 batch manufacturing plants, 400 employees and a turnover of £50 million, after being recognised as an exemplar in all aspects of energy and environmental management. Institute of Energy Member Richard Hellebrand received the Award.

A steering committee from AH Marks comprising the chairman, directors and senior managers was involved in designing the energy and environmental strategy for the company. The greatest environmental emissions are from the use of fossil fuels, so reducing these took the highest priority.

An integrated team implemented proposals and detailed plans were put into place with some 40 projects being undertaken between 1993 and 1995, at a cost of more than £1 million. This first phase was followed by the installation of CHP once a site was in good order. Energy consumption was reduced from 9.5 GJ/tonne to 5.6 GJ/tonne between 1992 and 1999.

Carbon dioxide emissions were reduced from 0.5 tonnes/tonne of product to 0.29, and NOx emissions from 3.0 tonnes/tonne to 0.6 tonnes/tonne over the same period.

Financial savings for AH Marks have also been impressive, with a total of £847,000 being achieved from 1993 to 1995, followed by a further £250,000 a year with the installation of the new CHP plant. And the CHP scheme will enable a Climate Change Levy bill of more than £200,000 per year to be avoided from next April.

The Chairman of the Judging Panel, Lord Ezra, said: "It is pleasing to see that this company has demonstrated a well thought out energy and environmental strategy. It has invested heavily and is now reaping substantial financial and environmental savings as a result."

## BEST ENERGY EFFICIENCY PROGRAMME

Superdrug won the award for the Best

Energy Efficiency Programme, sponsored by Gasforce.

Superdrug, which has 750 retail stores across the UK, recruited an energy manager in 1997 when its energy costs were around £5 million per year. A policy and strategy were developed in the same year and, crucially, the initiative was given senior management support.

A comprehensive strategy document with detailed data was compiled which was designed to lead to 32 GWh savings over a four year period and 26,000 tonnes of carbon dioxide savings per year. The energy savings goals have been achieved and the financial benefits have also been significant, with £9.9 million being saved over the four years. All store managers are now trained in energy efficiency and their stores are visited four times a year by technicians to survey their progress – managers are awarded bonuses if their energy budgets are met.

## BEST ENERGY STRATEGY

Lancashire County Council took the award for Best Energy Strategy sponsored by British Energy. The council, which serves a population of more than a million people, maintains the largest number of street and sign lighting installations in the UK.

The council has invested £2 million a year for more than six years in its energy strategy and is aiming for continued financial savings of £450,000 per year. In addition to the financial savings, the energy savings are 17.5 GWh/year with environmental reductions in carbon dioxide of 12,700 tonnes a year. A system has been put in to monitor the street lighting scheme and Lancashire is the first highway authority to achieve Energy Efficiency Accreditation status and get a rebate of £30,000.

## BEST USE OF GAS

The London Borough of Tower Hamlets won Best Use of Gas, sponsored by Mobil Gas.

The borough has responsibility for the refurbishment of the Barkantine Estate - which comprises five storey blocks, four tower blocks, low-rise maisonettes and flats, one block with gas heating and one with electric storage heaters. The site has mixed fuel use and an average system efficiency for the 408 communally-heated homes of 59%. Carbon dioxide emissions were estimated to be 11,000 tonnes a year. Adjacent to the tower blocks is a leisure centre with a swimming pool, so a community heating network using a 1.4 MW gas CHP system was proposed.

A detailed appraisal has been carried out (using PFI to help finance the scheme) which predicts savings of 30.4% on energy, carbon dioxide savings of 2472 tonnes per year and financial savings for residents of 60%. And as the scheme is financed through the use of PFI, it is revenue neutral for the borough.

## BEST USE OF ELECTRICITY

The supermarket Tesco was the winner of Best Use of Electricity, sponsored by Yorkshire Electricity. Tesco is the UK's largest food retailer with 659 stores, 20 distribution depots and 20 head offices. Historically Tesco spent £85 million a year, mainly on electricity.

An energy and environment strategy was put in place in 1995 which has held energy consumption at 1997 levels despite the opening of 59 new stores, a 1.9 million square foot increase in floor space and 200 stores operating on a 24 hour basis. Refrigerated plant has the lowest total equivalent warming impact and Tesco's worked with cabinet display companies to achieve this. Special lighting systems and building seals were also installed to further enhance energy savings. The retailer has now achieved energy savings of 475 GWh/year, annual carbon dioxide savings of 209,000 tonnes and financial savings of £16.6 million.



## November 2000

### NEMEX 2000

Exhibition and conference,  
1-2 November, Birmingham  
Details from Inside  
Communications,  
tel: 020 7772 8300,  
fax: 020 7772 8599

### European energy

Conference, 3 November,  
London, £695 + VAT  
Details from The Economist  
Conferences,  
tel: 020 7830 1177, e-mail:  
[economistconf@eu.com](mailto:economistconf@eu.com)

### Introduction to NETA

Course, 6 November, London,  
£699 + VAT  
Details from IIR Ltd,  
tel: 020 7915 5055, e-mail:  
[registration@iir-conferences.com](mailto:registration@iir-conferences.com)

### Fuel economy roadshow

Seminar, 7 November, London  
Details from IMechE,  
tel: 020 7973 1245,  
e-mail: [k\\_jewis@imeche.org.uk](mailto:k_jewis@imeche.org.uk)

### Heat pumps – development and application

Course, 7 November, London,  
£233  
Details from Mid Career  
College, tel: 01223 88016,  
e-mail: [courses@mid-career-college.ac.uk](mailto:courses@mid-career-college.ac.uk)

### Efficient use of electricity in buildings

Course, 8 November,  
London, £233  
Details from Mid Career  
College, tel: 01223 88016,  
e-mail: [courses@mid-career-college.ac.uk](mailto:courses@mid-career-college.ac.uk)

### The emergence of a pan-European gas business

Conference, 7-8 November,  
Edinburgh, £1200 + VAT  
Details from Overview Gas  
Conferences,  
fax: 020 7650 1431,  
e-mail: [confs@economatters.com](mailto:confs@economatters.com)

### E-business for oil and gas

Conference, 13-15 November,  
London  
Details from IQPC,  
tel: 020 7368 9300,  
e-mail: [oil@iqpc.co.uk](mailto:oil@iqpc.co.uk)

### Sustainability in public services 2000

Conference and exhibition, 14  
November, London, £195 + VAT  
Details from PNG Ltd,  
tel: 0800 542 9590,  
e-mail: [spsdel@govnet.co.uk](mailto:spsdel@govnet.co.uk)

### CHP – creating sustainable markets

CHPA national conference,  
16 November, London,  
£290  
Details from the CHPA,  
tel: 020 7828 4077,  
e-mail: [info@chpa.co.uk](mailto:info@chpa.co.uk)

### Fundamentals of power finance

Course, 17-20 November,  
Woking, £3055  
Details from the Petroleum  
Economist, tel: 020 7831 5588,  
e-mail: [jones@petroleum-economist.com](mailto:jones@petroleum-economist.com)

### Quality of electrical power supply

Course, 20 November, London,  
£233  
Details from Mid Career  
College, tel: 01223 88016,  
e-mail: [courses@mid-career-college.ac.uk](mailto:courses@mid-career-college.ac.uk)

### Emart 2000

Conference and exhibition,  
20-22 November, Amsterdam  
Details from Synergy,  
fax: +31 346 590 601, website:  
[www.synergy-events.com](http://www.synergy-events.com)

### Spark ignition engine emissions

Course, 20-24 November, Leeds  
Details from Alison Whitley,  
SPEME, University of Leeds,  
tel: 0113 233 2494, e-mail:  
[cpd.speme@leeds.ac.uk](mailto:cpd.speme@leeds.ac.uk)

### Profitable utilities: e-commerce

Conference, 21-22 November,  
London, £999 + VAT  
Details from IIR Ltd,  
tel: 0207 915 5055, e-mail:  
[registration@iir-conferences.com](mailto:registration@iir-conferences.com)

### Managing Energy

Institute of Energy Course,  
23 November, London,  
£99 + VAT Details from  
Suzanne Cooper,  
tel 020 7580 0077, email:  
[events@instenergy.org.uk](mailto:events@instenergy.org.uk)

### UK energy – creating value in a competitive market

In association with the  
Institute of Energy  
Institute of Economic  
Affairs conference,  
23-24 November, London,  
£849 + VAT. Details from  
Marketforce,  
tel: 0207 490 2296, website:  
[www.conferencecalendar.co.uk](http://www.conferencecalendar.co.uk)

### How to BREEAM buildings

Course, 28 November,  
Birmingham, £233. Details  
from Mid Career College,  
tel: 01223 88016, e-mail:  
[courses@mid-career-college.ac.uk](mailto:courses@mid-career-college.ac.uk)

### Emissions trading and the Kyoto mechanisms

Conference, 29-30 November,  
London, £1395 + VAT  
Details from ICM,  
tel: 0207 436 5735,  
fax: 0207 436 5741

## December 2000

### Nuclear Congress 2000 – Securing the future

Conference, 6-7 December,  
London  
Details from British Nuclear  
Energy Society, tel: 0207 665  
2315, e-mail: [frye\\_s@ice.org.uk](mailto:frye_s@ice.org.uk)

### How to BREEAM buildings

Course, 5 December, London,  
£233  
Details from Mid Career  
College, tel: 01223 88016,  
e-mail: [courses@mid-career-college.ac.uk](mailto:courses@mid-career-college.ac.uk)

### Gas turbine hot section life management

ERA course,  
11-12 December,  
Leatherhead, Surrey  
Details from Clare Church,  
tel: 01372 367117,  
e-mail: [courses@era.co.uk](mailto:courses@era.co.uk)

### Heat recovery steam generators

ERA course, 13 December,  
Leatherhead, Surrey  
Details from Clare Church,  
tel: 01372 367117,  
e-mail: [courses@era.co.uk](mailto:courses@era.co.uk)

## January 2001

### Ultra low NOx gas turbine combustion

Course, 15-19 January, Leeds  
Details from Alison Whitley,  
SPEME, University of Leeds,  
tel: 0113 233 2494, e-mail:  
[cpd.speme@leeds.ac.uk](mailto:cpd.speme@leeds.ac.uk)



## Register now for speaker's corner

**Renewables.** Fuel cells. Nuclear power. E-business. Coal. The list of conferences and events taking place each month is as diverse as the energy industry itself and unfortunately only a small cross-section of the events taking place can be featured here in *Energy World*.

The organisers of these events range from global commercial companies through to small local networks and Engineering Council-licensed Institutions. This means that

the Institute of Energy is frequently approached by different organisations, particularly in the not-for-profit sector, who are in the process of recruiting informed and credible speakers for their course, conference or workshop. This offers an ideal opportunity for individual members of the Institute of Energy to promote their specialist area of interest, academic research or perhaps a recent work initiative in the energy field. Speaking at such

events is usually unpaid (with a cup of tea thrown in!) but it is often an excellent opportunity to network with colleagues and to promote the Institute of Energy as a professional institute at the forefront of the energy industry and representing a body of expertise and excellence.

A database of all members who are willing to speak at such events, and their specialist areas, is now being created by the Institute's Events Officer, Suzanne Cooper.

If you would like to register as a potential speaker, your details will be held for future reference and you will be contacted by the InstE should the occasion arise. Your personal details will not be passed on to external organisations unless you specify otherwise.

If you would like to register on this database, please inform Suzanne of your contact details and specialist area by email: [events@instenergy.org.uk](mailto:events@instenergy.org.uk) or tel: 020 7580 0077.

## Council Elections

### Presidential officers and honorary officers 2001/2002

The undermentioned have been elected by Council to take office following the Annual General Meeting on 28 June 2001.

Mr J E INGHAM CEng FInstE to become President;

EUR ING R I WILKIE CEng MInstE - Honorary Secretary;

Mr D BARBER CEng FInstE - Honorary Treasurer.

### ELECTION TO COUNCIL 2001/2002

Following the AGM, the undermentioned will retire and are not eligible for re-election:

Mr M BAKER CBE FInstE, Mr M C ROBERTS OBE CEng FInstE

### NOTICE OF COUNCIL NOMINATIONS

Any ten Corporate Members may nominate in writing any duly qualified person to serve on Council. Any three Corporate or Associate Members may also nominate in writing an Incorporated Engineer to serve on Council. A vote for Associate Members would be by Associate Members only. All nominations, together with the written consent of the nominee to serve, should reach the Secretary & Chief Executive of the Institute not later than eight weeks before the AGM but preferably earlier. (Members are not, however, permitted to join in the nomination of more than three persons in any one year).

## OBITUARY

## Trefor David

**Trefor was a** past chairman of the South Wales and West of England Branch and a Committee Member for more years than I care to remember.

I first met him on a business basis more than 40 years ago and as a young engineer readily appreciated:

- the knowledge and experience freely given in his particular field of engineering,

- his sense of humor and ready wit,
- his sincere enthusiasm for all things Welsh including rugby, singing and debating and, of course,
- his enthusiasm for his hobby railways.

As a Committee member Trefor was always helpful and constructive in discussion, critical when he thought it necessary, had an opinion about most

things but could always relieve tension in a tricky situation with his ready wit and enthusiasm.

Trefor was always prepared to talk with extreme pride and appreciation of his wife Anne

and his family. He will be sadly missed by committee members and friends in the South Wales and West of England Branch.

**Douglas H Mustoe,**  
CEng FInstE

## DECEASED MEMBER

**It is with regret that we report the death of the following member:**

**KELSEY, Stuart Mark,** AMInstE, YOR





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## Hot off the press - New InstE Brochure

Don't delay in ordering your copy  
of the new InstE brochure,  
available in January 2001.

Contact [info@instenergy.org.uk](mailto:info@instenergy.org.uk) or  
call 020 7580 7124,

for copies of the brochure to read up on  
all of the new InstE services.

Do your bit to promote membership of the InstE  
and pass a copy to a colleague.

**U W C N**

**UNIVERSITY OF WALES COLLEGE, NEWPORT**

### INSTE DIPLOMA IN ENERGY MANAGEMENT & BTEC CPD CERTIFICATE

A course for engineers and others responsible for energy use who wish to learn more about the management and technology of energy related systems. Available through flexible learning, enabling you to study at your own pace and at times to suit.

Evening University-based tutorials are held each week, or by distance learning with tutor support.

The course involves two years study to achieve both the BTEC CPD Certificate in Energy Management (year 1) and the InstE Diploma in Energy Management (year 2).

The InstE Diploma has two available options: Industrial and Commercial. The content of each reflects the issues associated with energy management in the relevant sector.

The InstE Diploma in Energy Management is assessed by examination and project presentation.

The BTEC CPD Certificate is assessed by assignments and written and oral presentations on the project.

No formal qualifications are required for entry to either stage of the course.

Course fees are just £155 for the BTEC Certificate and £160 for the InstE Diploma.

For further details, please contact Dr Ken Edwards on:  
Tel: 01633 432432, Fax: 01633 432850, email: [uic@newport.ac.uk](mailto:uic@newport.ac.uk)

UWCN DEPARTMENT OF ENGINEERING  
Allt-yr-yn Campus, PO Box 180, Newport, NP20 5XR

### SOUTH WALES AND WEST OF ENGLAND BRANCH

## 28th Idris Jones Memorial Lecture

*Sponsored by CPL Products*

Cardiff Castle, Friday 23 February 2001  
10.00 Coffee  
10.45 Lecture

**Achieving the United Kingdom's commitment  
to CO<sub>2</sub> emissions reduction by 2010.**

**Dr Eoin Lees - Chief Executive Energy Saving Trust**

12.15 Reception  
13.00 Branch Annual Luncheon.

Admission to the Lecture is free, however,  
please apply for tickets.

Lunch tickets: Members of Institute of Energy £12, non-members £15

Please apply in writing enclosing cheques, payable to  
The Institute of Energy, to Mr. David Suthers,  
2, Dan-y-bryn Close, Radyr, Cardiff CF15 8DJ  
Preference will be given to Members of Institute of Energy  
until 15 January 2001.

**NUMBERS ARE LIMITED, SO BOOK NOW!!!**

**Enmat International** has signed a long term

Technical Assistance Agreement with OSJC Alautransgas,  
the major LPG Company in Kazakhstan.

Support will be given in planning the re-development of  
the LPG operations carried out by Alautransgas, including the  
technical training of personnel.

The agreement will support a Loan being provided by  
The International Finance Corporation,  
a branch of The World Bank.

Alautransgas operate from eight major LPG terminals,  
covering an area the size of Western Europe.

Supplies of LPG are transported from local refineries,  
and from Russia, utilising a company owned fleet of  
more than 1,500 modern rail tank cars.

The large fleet of bulk tankers and cylinder trucks handling local  
deliveries, all use LPG as engine fuel.

Specialist LPG equipment manufacturers interested in  
servicing this re-development should  
contact Don Barber at Enmat International for further  
information on tel: 01494 783142, by fax: 01494 583701,  
or by email: [rufused@aol.com](mailto:rufused@aol.com)



## NEW MEMBERS

### NORTH WESTERN

**Mr T Gregg** Student  
Leeds Metropolitan University  
**Mr C Bradshaw** MInstE  
March Consulting Group

### LONDON & HOME COUNTIES

**Dr M J Entwisle** MInstE  
Max Fordham & Partners  
**Ms J Ward** FInstE  
National Grid Company  
**Superdrug Stores Plc.**  
Group Member  
**Ms C Warnes** Student  
University of Loughborough  
**Energy & Power Consultants**  
Group Member  
**Ms J Madden** Student  
Cambridge University  
**Ms L Tai** Student  
Nottingham Trent University

### SOUTH WALES & WEST OF ENGLAND

**Centre for Sustainable Energy**  
Group Member  
**Mr A R Cameron** Student  
University of Wales, Swansea  
**Mr M Yassin** Associate  
Lloyd Maunder Ltd

### EAST MIDLANDS

**Mr S Greenwood** Student  
Cambridge University  
**Mr J A Chamberlain**  
Graduate  
Andover Controls Ltd

### OVERSEAS

#### HONG KONG

**Ms I P L Lau** Graduate  
Hong Kong Government

## BRANCH EVENTS

All members are welcome to attend these events regardless of the branch they are organised by.

### NOVEMBER 2000

#### BALLYMENA

Date to be confirmed  
ECOS centre, Ballymena  
Contact Dr D McIlveen-Wright,  
Northern Ireland branch,  
tel: 01265 324477, email:  
dr.mcilveen-wright@ulst.ac.uk

#### SHEFFIELD

**15th November 14.00**  
"Bringing CHP to the Home"  
John Parsons, BG Technology  
Sheffield University.  
Contact Andrew Mallallieu,  
tel: 0113 276 8888 ext 2324

#### BIRMINGHAM

**15th November**  
**18.00 for 18.30**  
LPG in Automotive Vehicles  
Joint meeting with the  
Institute of Petroleum.  
Contact Mark Ward Associates,  
tel: 01299 896 6554,  
email: margaretward@  
markwardassociates.co.uk

#### WARRINGTON

**16th November 17.45**  
Metal Heating with Oxy-Fuel  
Burners. John A. Davies,  
Managing Director, Rapid Flame  
Contact Matthew Cropper  
tel: 0192 5254384, email:  
matthew.cropper@aeat.co.uk

#### ULSTER

**15-18 November**  
**ENTREE 2000**  
Environment Training in  
Engineering Education  
Contact Alan Strong,  
University of Ulster  
Tel: 028 90 366371  
email: wa.strong@ulst.ac.uk  
or Sirkka Poyry, EEE Network,

Brussels +32 75 909 391  
email: sirkka.poyry@skynet.be

#### WATFORD

**21st November**  
White Collar CO<sub>2</sub>: a discussion  
Contact Joanne Wade on  
tel: 020 7359 8000,  
email: joanne@ukace.org

#### WISHAW

**24th November**  
Annual Dinner Dance at  
The Belfry, Woodland Suite.  
Contact H Freeman,  
tel: 0121 353 2397  
email: hfreeman@talk21.com

#### SCOTLAND

**29th November**  
Visit to Longannet Power  
Station. Contact: John Currie,  
tel: 0131 455 2253  
email: j.currie@napier.ac.uk

### DECEMBER

#### NOTTINGHAM

**6th December 19.00**  
Annual Joint Prestige Lecture:  
The London Eye by  
Dr. Allen Mann  
Technical Director, Allott and  
Lomax Consulting Engineers  
Contact: Michael Allen  
tel: 01526 323009, email:  
ioe@mike-allen-associates.co.uk

#### BIRMINGHAM

**7th December**  
"Technical & economic benefits  
of trigeneration based upon  
small scale CHP" -  
Mr. J. Pearson at Austin Court.  
Contact H Freeman, Midland  
Branch Tel: 0121 353 2397  
email: hfreeman@talk21.com

#### WARRINGTON

**7th December 17.45**  
The Climate Change Levy  
Dr. Joanne Westlake,  
Energy manager, BP  
Contact Matthew Cropper  
tel: 0192 5254384, email:  
matthew.cropper@aeat.co.uk

#### SCOTLAND

**15th December**  
(to be confirmed)  
Social evening. Contact: John  
Currie, tel: 0131 455 2253  
email: j.currie@napier.ac.uk

#### LONDON

Date to be confirmed  
Use of solar technology in  
the UK. Evening discussion at  
Imperial College, London.  
Contact Joanne Wade,  
tel: 020 7359 8000  
email: joanne@ukace

#### NEWCASTLE-UPON-TYNE

**5th December**  
**17.30 for 18.00**  
'Offshore Reserves-  
exploitation using  
novel gas processing facilities'  
Keith Hutchinson, Armstrong  
Technology Centre of  
Advanced Industry  
contact Colin Howarth  
tel: 0191 222 7266  
email: c.r.howarth@ncl.ac.uk

#### CARDIFF

**Friday 8th December**  
Committee Meeting  
5.00pm -6.00 pm: Social Event  
at Harry Ramsdens.  
Followed by quiz night £10.00.  
Contact John Whitehead,  
tel: 01242 673361  
email: whitehj@cregroup.co.uk





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## Membership Interviewers

Dear Members,

As you are probably aware, candidates applying for membership of the Institute, who complete a Professional Review Report, are required to be interviewed. Under the new SARTOR regulations, all interviewers must be trained and the Institute is obliged to keep a register of trained interviewers.

If you, as a Member, Fellow or Associate Member, would like to assist your local branch by conducting membership interviews, please contact Tracey Fisher by email at: [tfisher@instenergy.org.uk](mailto:tfisher@instenergy.org.uk) or by telephone on 020 7580 0077 to arrange your training and registration.



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## Subscription Notices

Dear Members,

You will shortly be receiving your subscription notice for the year 2001. In keeping with last year's format, the notice contains a brief questionnaire that will aid the Institute in delivering the services that you would like, so please complete this and return it to the Institute.

Members who forward their subscription payment before 31st December 2000 will be entitled to receive a free Continual Professional Development Planner. All that we ask is that you pay for its postage. Should you wish to receive the Planner please add £2.50 (for postage and packaging) to your payment and return it by 31st December 2000.

Please contact Sam Cobbina on 020 7580 7124 or email at: [scobbina@instenergy.org.uk](mailto:scobbina@instenergy.org.uk) if you have not received your subscription notice or if you have a financial query. If you require assistance regarding concessionary subscription rates then please contact Gareth Dart on 020 7580 0077 or email: [membership@instenergy.org.uk](mailto:membership@instenergy.org.uk)

## SITUATIONS VACANT/WANTED

### Gas Engineer [Ltd.]

Anticipates availability for :  
Utilisation, site engineering  
works, et al.  
Experienced, qualified,  
commercially aware.

### Chemical Engineers

Seek Alternative Positions  
Levels: Technician up to PhD.  
Functions: Energy, Environmental,  
Process, Water / Waste  
management.

### Thermodynamicist [freelance]

Anticipates availability Nov. 2000  
Excellent IT skills plus  
practical experience.  
Results delivered at realistic rates,  
home based.

### Energy Engineers

Seek Alternative Positions  
Levels: Graduate up to MD.  
Functions: Energy Management,  
Building Services, CHP,  
Power Equipment.

Enquiries welcomed via email to Steve Howe. Specific: [admin@energy121.com](mailto:admin@energy121.com) General: [info@energy121.com](mailto:info@energy121.com) Alternative: [121@clara.co.uk](mailto:121@clara.co.uk)

### Maxon Combustion Systems,

Coleshill, UK are looking for a  
**Sales Engineer** with  
management potential. Must be mature  
with relevant degree and experience.  
Phone Arthur Street on 01675 464334 or  
email: [ajs@maxon.be](mailto:ajs@maxon.be)

### TM Resource

Require experienced, computer literate,  
project and utility engineers / consultants  
to work throughout the UK.  
Excellent salary, plus car, bonus scheme,  
pension etc.  
Visit our website at: [www.tm-esource.com](http://www.tm-esource.com) and  
email your CV to:  
[tmresource@tmworldwide.co.uk](mailto:tmresource@tmworldwide.co.uk)

### MSc Graduate seeks employment

BEng (Hons) Environmental Energy  
Engineering, 1st class Degree & Prize  
winning. MSc Combustion & Energy  
Studies Student. Would like to work in  
relevant field immediately.  
Please contact Steve Mills on  
01773 605850 or 07931 344 234

### Technician Required

For National M & E Company. Adaptive  
training provided. PC planned  
maintenance & daily facilities  
management. PAYE package.  
Rural Midlands.

### Project Engineers Required

For UK Industrial Energy Plant.  
Experienced "in the field", commercially  
aware and computer literate.  
Salary, car, bonus, pension etc.

### Tariff Analyst Required

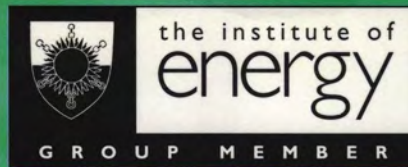
Must be good.  
Based Midlands [preferred],  
London a possibility.  
PAYE, established company.

Confidential enquiries welcomed, via email to Steve Howe. Specific: [admin@energy121.com](mailto:admin@energy121.com) General: [info@energy121.com](mailto:info@energy121.com) Alternative: [121@clara.co.uk](mailto:121@clara.co.uk)

Please note: This space will be dedicated each month to individuals and organisations wishing to advertise situations vacant or situations wanted. Please note that this service is FREE.

For more details contact Beatriz Cano on tel: 020 7580 7124, fax: 020 7580 4420 or e-mail: [eworld@instenergy.org.uk](mailto:eworld@instenergy.org.uk)





**THE INSTITUTE OF ENERGY  
IS PLEASED TO THANK THE FOLLOWING ORGANISATIONS  
FOR THEIR SUPPORT DURING 2000 AS MEMBERS OF  
THE GROUP MEMBER SCHEME.**

We look forward to continuing our work with members in 2001 for the benefit of them and their employees. For information about the Group Membership Scheme please email: [skumar@instenergy.org.uk](mailto:skumar@instenergy.org.uk) or telephone 020 7580 0077 for an information pack.

**3 M United Kingdom Plc  
AEEU  
Alliance Gas Ltd  
Andersen Consulting  
B9 Energy Services Ltd  
Bailey Partnership  
BG Plc  
BP Energy  
British Telecommunication Plc  
BS Burner Services Ltd  
Calderas Paradies Ltd  
Calor Gas N I Ltd  
Centre For Sustainable Energy  
Ceram Research  
CGU Insurance Plc  
CORUS  
Dalkia Energy & Technical Services Ltd  
Datum Solutions Ltd  
Department of the Environment,  
Transport and the Regions  
Dresser Rand (UK) Ltd  
EAGA Partnership Ltd  
Electricity Association Services  
Energy and Power Consultants  
Energy Information Centre  
Energy International (UK) Ltd  
Energy Services (UK) Ltd  
Energy Technology Support Unit  
Entech Energy Consultants Ltd  
Fortum  
Friskies Petcare (UK) Ltd  
Fuel Furnace Services Ltd  
Galway Energy Agency**

**Henry Toner & Associates  
Irish Energy Management Ltd  
Joules Energy Efficiency  
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Power Ink Limited  
PowerGen plc  
Powergen Power Technology  
Prudential Corporation  
Ram-energy Ltd  
Rolls-Royce Plc  
Romanian Energy Policy Unit  
Royal Borough of Kensington &  
Chelsea  
Sainsbury's Supermarkets Ltd  
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Sevenoaks District Council  
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TM Resource  
United Distillers**