THE MAGAZINE OF THE INSTITUTE OF ENERGY

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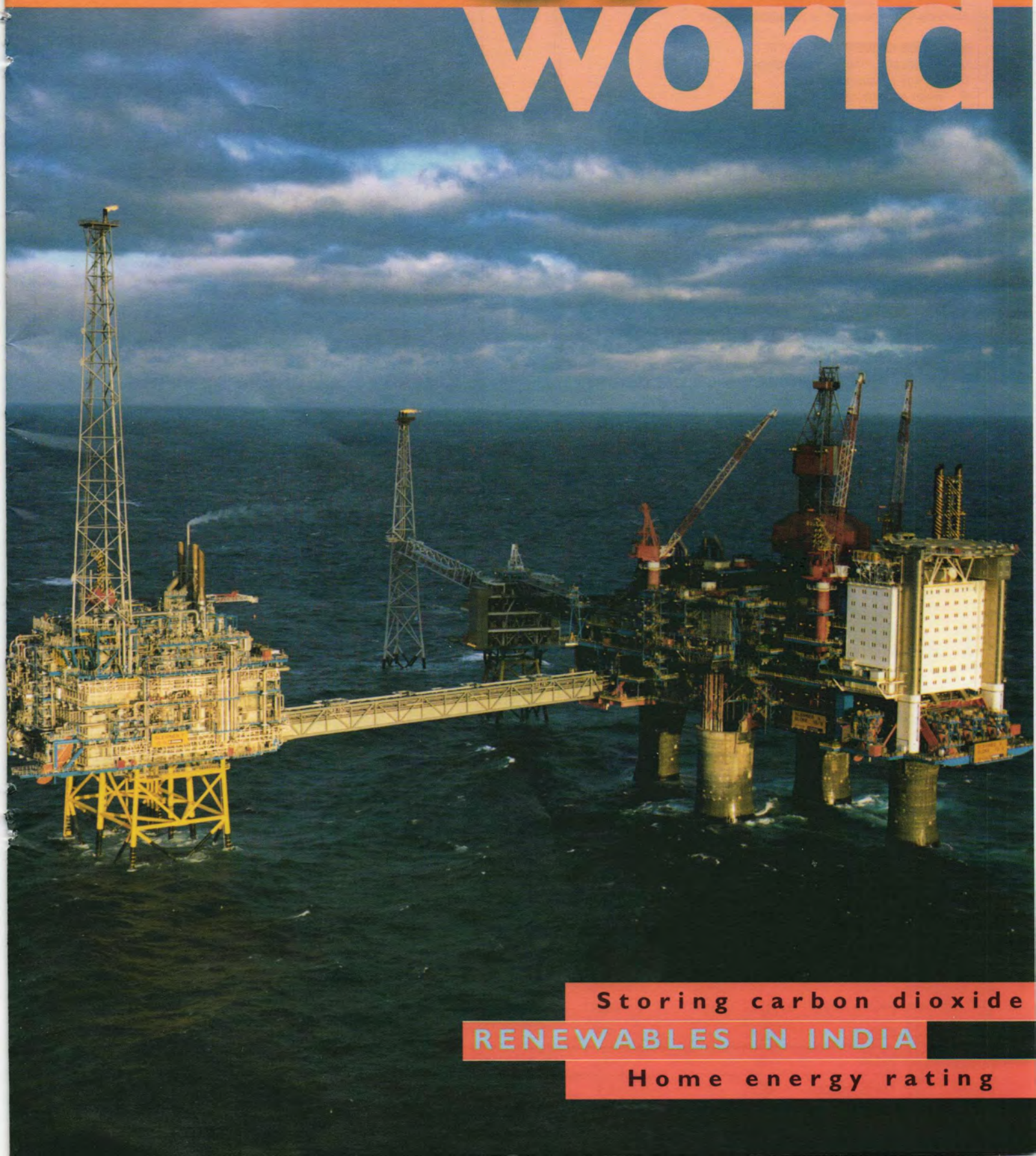

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RENEWABLES IN INDIA

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Correction

An error appeared in the presentation of Table 6 on page 21 of the May issue of *Energy World*. The table should have looked like this. Apologies.

Table 6 Percentage change compared with conventional diesel

Pollutant	City diesel	City diesel + catalyst	City diesel + particulate trap	LPG
HC	0	-46	-78	-44
CO	2	-79	-84	-33
NOx	-5	-6	-16	-76
Particulates	-32	-54	-88	-61

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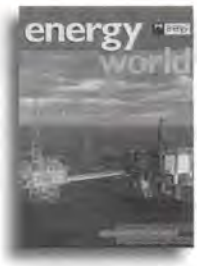

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COVER

Platforms at the Sleipner West gas production field in the North Sea. In a pioneering project being monitored by the IEA Greenhouse Gas R&D Programme, equipment on the platform on the left extracts carbon dioxide from the natural gas stream, and re-injects it into the Utsira saline water reservoir some 800m below the sea bed. The project stores around 1 million tonnes a year of carbon dioxide.

See page 20 for an article on the scope for capturing and storing carbon dioxide as a means of controlling global warming.

Energy futures - how will competition continue to unfold?

by Peter Franklin, Corporate Affairs and Business Development Director, Calortex

There are many ways in which energy markets may evolve further in the coming months and years. While real competition among industrial and large commercial consumers is now well-established, there is some way to go before fully effective and sustainable competition becomes the norm for domestic and small commercial users of piped natural gas.

I take it as axiomatic that true competition in energy and other markets delivers the benefits that consumers desire in terms of lower prices, improved service and product innovation. Consumers will, through either personal choice or the actions of their representatives in government or the regulator, force competition into being. The key variable here is timing: progress can be fast or slow. However, the faster that effective and sustainable competition is enabled, the sooner the consumer will reap the full benefits.

"He who foretells the future lies - even if he tells the truth" - Arab proverb

Let us look at the lessons of history. The US has some striking examples worthy of note: the break up of Standard Oil in the early days of the oil industry and the break up of the Bell telecommunications empire. In both cases this led to the establishment of a market structure able to sustain a multiplicity of vibrant competitors which delivered lower prices, improved service and product innovation to the consumer.

Closer to home we have the success achieved in the UK commercial and industrial gas markets, where successful regulatory steering led to the emergence of seven or eight large players of something like the same size as the previous incumbent monopoly. This in turn has led to UK industry enjoying the lowest gas prices in the western industrialised world.

It is interesting to contrast the development of competition in the UK telecommunications market. In the traditional land line sector this has been disappointingly slow, with the incumbent player holding on to more than 85% of the market after more than ten years of liberalisation. Even worse, the only significant contender to the monopoly, Mercury, pulled out of the race to capture the hearts of the UK public. The consequence of this has been delays in the time taken for service standards to rise to the level which US citizens (in a fully competitive arena) have long taken for granted. Innovation by the UK incumbent has been slow - it has been the last player to enter the market for Internet service provision.

The good news, however, is that the consumer has been rescued by technological change which has changed the rules of the game through cable, mobile and radio telephony.

Focusing back on the gas market I can envisage two alternative scenarios: one in which incumbent supplier maintains an excessively dominant position for a significant period of time ('status-quo perpetuated'); the other where government and/or regulatory intervention positively creates the market structure which can support long term competition ('competition revitalised').

What are the consequences of moving into one or other of these scenarios?

In the 'competition revitalised' world it is likely that beach gas prices will be significantly lower than in the 'status quo perpetuated'. This is because the interface between the upstream and downstream sectors of the industry would be characterised by much greater competitive interplay. This in turn would spur on the drive for technological innovation to drive down exploration and production costs - as was evidenced in the North Sea oil business following the 1986 oil price collapse.

In the 'status quo perpetuated' world this driver would be absent and there is a grave risk of a market of accommodation coming about, where the effective downstream monopoly is happy to accept higher prices, competitors have no access to cheaper gas (since they lack the buying power) and the consumer foots the bill. With gas costs representing some 40% of the delivered price to the domestic end consumer this could be quite some bill.

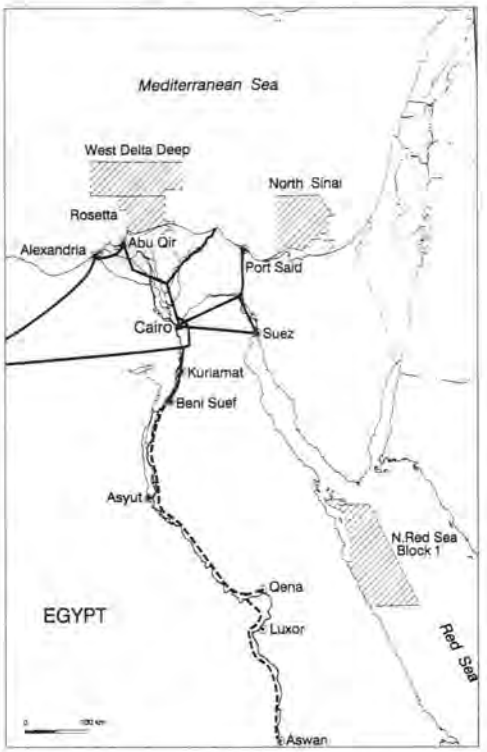
Which scenario will come about? The picture is complicated by the fact that the UK regulatory structure is about to go through a major change following the recent Green Paper on the subject. There is currently great uncertainty as to who will be leading the way forward in future, but whoever it is will have strong influence over which scenario comes about. However, the good news for energy users is that consumer protection will be the primary priority of the new regulatory body - and competition and consumer choice are the best way of securing that protection.

In the very long term I believe that the consumer will be king - and that if a fully competitive gas market structure does not evolve in the short term, then regulatory intervention is inevitable. Technology will not come to the rescue as it has done in telecommunications.

It would be a pity, however, if consumers are made to wait longer than necessary to reap the full benefits which true competition can bring.

BG to develop gas market in Upper Egypt

A partnership including BG plc has signed a franchise agreement with the Egyptian General Petroleum Company for the exclusive right to develop the gas market in Upper Egypt, involving a major extension to the Egyptian gas transmission and distribution system. BG, Edison International, Orascom and Middle East Gas Association are forming a new company, the Nile Valley Gas Company for which BG will be lead participant to undertake the development of the gas market and infrastructure.



The 25-year franchise agreement provides for the project to be undertaken in a series of phases, the first of which will be to extend the gas transmission network from south of Kuriamat to Beni Suef (see map) and to provide gas to industrial consumers and to over 20,000 domestic customers in Beni Suef. Investment in this first phase will be approximately $50 million.

Work will commence immediately on preparation for the second phase which will extend the transmission network 270 km from Beni Suef to Asyut. Combined investment in phases one and two will be $220 million. There is provision for two further phases, 260 km from Asyut to Qena, and 270 km from Qena to Aswan.

Oil production cuts fail to sustain raised prices

Rock-bottom oil prices of late are having their effects on international production totals, according to the *IEA Monthly Oil Market Report*, as less oil is now being shipped as a result of an agreement between OPEC and some non-OPEC producers to reduce output. The combined commitments on cuts total about 1.5 million barrels per day (mb/d). While this is less than half the projected imbalance for the second quarter of this year of 3.5 mb/d, it is, says the IEA Report, apparently sufficient to raise oil prices from their recent lows.

However, current supply exceeds demand and stocks are high, suggesting a continuation of a difficult market for producers

The steep decline in crude prices came to an abrupt halt in March following an unexpected supply agreement between Saudi Arabia, Mexico and Venezuela - but only after they had dipped to the lowest levels in almost a decade. Crude prices then increased sharply but have subsequently settled into a volatile, directionless trading range.

'World's first' high-voltage generator

ABB has launched what it says is the world's first generator able to supply electricity directly to the high-voltage network without the need for transformers.

According to ABB, the 'Powerformer' can generate electricity between 20 and 400 kV. The first operational generator, with a rating of 45 kV, is to be installed at a power plant in northern Sweden owned and operated by the Foundation Porjus Hydro Centre. The centre, which serves as a development and training facility for hydro power technology, is run by the Vattenfall, Kvaerner Turbin and ABB.

The Powerformer represents a completely new concept in generator technology, says the company. It uses advanced cable technology to generate high voltage directly, eliminating the need for a transformer and other equipment required where electricity is to be transmitted over long distances via a high-voltage network.

Philippines hydroelectric project

US-based Raytheon Engineers & Constructors have been awarded contacts totalling more than $700 million from San Roque Power Corporation to design and build a dam and power plant on the Lower Agno River at San Roque on the island of Luzon in the Philippines. San Roque, a joint venture of Marubeni Corporation and Sithe Energies, was chosen as the developer of the project by the Philippines National Power Corporation.

The earth and rock-fill dam will be approximately 1100 m long and 200 m high, making it the twelfth highest embankment dam in the world. The 345 MW rated hydroelectric power plant will consist of three 115 MW generating units.

Work should be completed by 2003.

ACBE adds weight to calls for a carbon tax

The move to a less carbon-intensive energy economy can be achieved, if the government creates sufficient incentives - possibly including a carbon tax - to alter behaviour by energy consumers, according to the latest report on climate change by the Advisory Committee on Business and the Environment (ACBE).

Published to the Prime Minister in April, the report recommends a comprehensive programme of measures, including increased take-up of new technology, voluntary agreements, market transformation, trading, support for renewables, and consideration of a carbon tax. It calls on the Government to "create a long term flexible policy framework which stimulates innovation and new technology, while also providing sufficient incentive to change behaviour across all sectors including housing and transport".

David Davies, Chairman of ACBE, said: "Behavioural change is needed in our approach to energy and there are substantial commercial opportunities available to the UK if we get our policy framework right. There is scope for early action on encouraging new technology and market transformation as well as voluntary agreements to cut carbon emissions in many business sectors but these may not be sufficient in themselves to meet the UK's legally binding targets.

"We have therefore recommended that if further measures are required, Government should consider the case for a carbon tax, providing it is set at a level which does not lessen UK competitiveness, that its revenues are fully recycled, and used to encourage low carbon technology, that it is targeted to achieve change in behaviour, and should not fall exclusively on business.

ACBE has therefore added its weight to those pressing the Government to institute some sort of carbon tax. Chancellor Gordon Brown started this ball rolling seriously by announcing in the March budget that he had asked Sir Colin Marshall is to head a review to examine "whether economic instruments, such as an industrial energy tax, should be introduced to curb industrial emissions".

- Deputy Prime Minister John Prescott has formally signed the Kyoto Protocol on behalf of both the UK and, in his role under the UK presidency of the EU, the European Commission. He signed the agreement in New York in April. The Protocol, agreed in Kyoto last December, will come into force once 55 countries have ratified it.

Lee Beesley has introduced a mobile high voltage oil filtration service as part of its portfolio of predictive maintenance programmes. The new on-site service is aimed specifically at high voltage systems users and in particular to assist companies in the development of a transformer maintenance policy.

Why the moratorium 'should remain in place'

The Government moratorium on new gas-fired power stations should remain in place for another two or three years, argues Jim Watson from Sussex University's Science Policy Research Unit in a submission to the Government's review of fuels for power generation. Watson argues that, with some 5,500 MW of new CCGT capacity now under construction, the moratorium will have no significant short-term effect - CCGTs will generate around 50% of the UK's total electricity needs by 2000 with or without the current moratorium due to end this month.

The present moratorium should remain in place, he argues, for four main reasons.

First, the rapid development of the technology behind the 'dash for gas', together with UK generators' desire to buy the latest state-of-the-art technology, have contributed to a series of delays and breakdowns at many CCGT plants. Ideally, reliability problems associated with one vintage of CCGT would be addressed before the subsequent (and more efficient) generation is introduced.

Second, the combination of incentives which have encouraged the 'dash for gas' have held back plans for projects based on clean coal technology. Whilst many of these technologies are still regarded as pre-commercial, support needs to be given for clean coal plants now (together with measures to curb open cast mining) if a British deep-mine coal industry is to be preserved.

Third, the interaction between the gas and electricity markets, particularly when demand peaks coincide, has given rise to increasing concerns over operational security. These concerns do not necessarily stem from a shortage of gas, but they show that there are limits imposed by the gas delivery system, the frequency response requirements of the electricity grid, and the availability of backup fuels at CCGTs with interruptible gas supply contracts.

Fourth, the increasing proportion of CCGTs in the UK has accelerated the depletion of the UK's gas reserves.

Government advertises for new energy regulator

The Government has begun its search for a new 'energy regulator' to replace both Clare Spottiswoode at Ofgas and Professor Stephen Littlechild at Offer. Professor Littlechild has agreed to leave his post some time this year in favour of the new appointee, while Ms Spottiswoode's five year contract expires at the end of October.

An advertisement appeared in the Sunday Times of 3 May for a new director general of gas supply, with the person appointed expected to become the first energy regulator for both gas and electricity.

The move follows publication of the Government's long-awaited Green Paper on utility regulation, which includes plans to bring the gas and electricity regulators, Ofgas and Offer, together into a single body. The Green Paper: *A Fair Deal for Consumers: Modernising the Framework for Utility Regulation,* also proposes to retain the RPI-x price regulation formula and require regulators to be more open by providing reasons for key decisions.

Launching the Green Paper in March, President of the Board of Trade Margaret Beckett stressed that it aims to shift the balance of regulation firmly back to protecting consumers: "The privatised utilities were sold too cheaply and price controls set by the previous Government on privatisation were too lax. It is now time to learn lessons from the existing regulatory regime - to ensure that consumers are better served in the future."

Energy efficiency and environment groups pounced on the proposal within the Green Paper for the Government to "issue statutory guidance for each sector on social and environment objectives". Regulators would then make arms-length decisions to meet the objectives.

Climate change - impact on building services

The Building Services Research and Information Association (BSRIA) is currently undertaking a DETR-sponsored study to assess the possible impacts on the building services industry of the predicted changes in the UK climate.

With significant climate change predicted to occur within the next 50 years, buildings currently being designed for use well into the next century and a large proportion of existing stock which will still be in use in 50 years, now is the time to start preparing to meet the challenge of climatic change.

According to the Centre for Construction Ecology at BSRIA, current forecasts suggest that winter and summer temperatures will increase with the effect of:

- reducing the mean annual frequency of days below 0°C
- increasing the mean annual frequency of days above 25°C
- decreasing heating degree days by about 20%
- increasing cooling degree days in some areas to twice their current value.

These, together with increases in relative humidity, summer solar radiation in the south, and wind speeds, are indicative of the potential for impact on buildings and especially on the services required to maintain suitably controlled indoor environments.

Gas market manoeuvres

More than five years since the commercial (or small-firm) gas market was opened to competition and almost a decade since the liberalisation of the industrial (large-firm) market, competition is still gaining on British Gas (now Centrica).

Looking at the commercial, industrial and interruptible markets as a whole, a new report from MarketLine International suggests that Centrica is still the dominant supplier but its dominance has fallen significantly since 1997, when it was three times the size of the largest independent. Now it is just over twice the size of its next largest competitor, Eastern Natural Gas (ENG).

The report reveals that ENG is now the largest independent, with over 12% of the combined gas market, and Centrica's share of the UK market has fallen again over the last year - from 28% in 1997, to 26% now.

Among the new entrants to the market there has also been some repositioning over the past year. ENG, with 12.1% of the total market, is now the largest independent, moving Mobil Gas marketing, with a 10.3% share, into second position.

Dow Jones launches gas price indexes

Dow Jones has introduced a suite of three new indexes to track the UK's spot market for natural gas: a day-ahead index, an average price (in pence/therm) of natural gas sold at the National Balancing Point for next-day delivery, together with similar indexes for gas sold for Saturday and Sunday delivery, and for delivery in the next calendar month.

All indexes are based on traded prices collected from more than 20 market participants. *The Dow Jones UK Natural Gas Price Indexes* will be published daily on the real-time Dow Jones Energy Service, available through Dow Jones Markets, and in The Wall Street Journal Europe, and will be made available to other media.

These new indexes will serve as benchmarks for the UK gas spot market, says the company, providing an additional level of transparency in a relatively new and growing market area.

CHP provides cooling at Stansted Airport

BAA Stansted has opted for CHP technology to provide electricity, heating and air cooling for its newly fitted-out, £17 million Satellite 2 terminal.

Due to come into commission later this year, the 300 kWe gas-driven unit was supplied by CHP specialist Nedalo UK Ltd and will provide heating and electricity for the 6000 m^2 building, including four aircraft loading jetties.

The unit will also provide summer cooling through interface with an overhead chilled beam system. Low pressure hot water from the CHP unit provides the energy for an absorption chiller, which in turn reduces the temperature of water for the cooling system. This is then circulated round the chilled beams in the ceiling of the satellite building, creating a natural cooling effect by convection.

Unusually, the Stansted CHP is sized on the base electrical power requirement of the site, and not the base heat load (as is conventionally the case). This is because the hot water can still be utilised in summer for chilling purposes - making this application perfectly suited to CHP. The unit will be operational for 17 hours per day, 365 days per year.

BAA also opted for Nedalo's Optima Finance Scheme, to ensure that savings begin as soon as the unit is installed. Under the scheme, installation and service are free, and the electricity generated is purchased from Nedalo at a reduced cost.

Leicester plans biomass-fuelled CHP for campus

The final component for a pioneering renewable energy complex is now in place at De Montfort University's (DMU) Caythorpe Campus. The project, which was awarded £600,000 from the European Commission, is bringing together the eco-friendly energy sources of animal and vegetable waste, wind power and coppiced wood for the first time.

The final component of the system - the gasifier - has just been installed at Caythorpe by the partner team from the University of Zaragoza in Spain. This will transform wood from sustainable sources at De Montfort's Riseholme campus into carbon monoxide which will be used to fuel combined heat and power units on site. An anaerobic digester, to produce methane gas from both animal and vegetable matter, was installed in autumn 1997. The digester will also provide gas for use in the CHP units. A wind turbine was delivered and installed during December 1997 by the French company Vergnet SA.

De Montfort University's team is now integrating the components to complete the system and is proceeding with alterations to the infrastructure of the site. The project is due to be launched in September.

ScottishPower launches 'Green Energy'

ScottishPower is to be the third electricity company to introduce into a 'green' tariff based on renewable energy. It plans to offer its three million electricity customers the opportunity to fund renewable energy projects under a new tariff called 'Green Energy'.

Householders and small businesses supplied by ScottishPower or its subsidiary Manweb will be invited later this year to opt for the new tariff from which funds will be invested in wind and hydro generating plant that would not otherwise have been built.

The energy projects to be funded will be chosen by ScottishPower in conjunction with community groups. A number of suitable options have already been identified.

Wind farm planned to compete outside NFFO

The first wind farm in Britain to operate outside the government's support programme for non-fossil fuels (NFFO) is being planned by the Stroud-based Renewable Energy Company. The aim is to compete effectively in the newly privatised UK electricity market according to *Wind Directions*, the journal of the European Wind Energy Association.

In a similar pattern to the 'green electricity' schemes already being marketed, customers would be asked to commit themselves to buying all their power through the company. A critical mass of about 2,000 customers would be needed to make the wind farm viable. But the major difference between this and other proposals is that they would not be asked to pay extra for using a non-polluting source.

UKAEA to excavate Dounreay waste shaft

The UKAEA is to excavate for safer storage and treatment material from a vertical shaft, used since 1959 for disposal of radioactive waste, at its Dounreay site in Caithness. The shaft, 55 m deep by 3.5 m wide and now water-filled, was originally dug in the 1950s to remove soil during excavation work to build a sea discharge pipeline, after which its base was sealed with a concrete plug.

After being licensed as a disposal site for 'intermediate level' nuclear waste in 1959 by the Scottish Office, the shaft was used for routine disposal of waste between 1959 and 1971. It was then used for the disposal of large, bulky items for a further six years before an explosion, caused by the build-up of hydrogen gas, caused its use to be ended. The Dounreay management has a list of over 11,000 items deposited in the shaft.

Now, the Government has agreed proposals to retrieval for safer storage and treatment of the legacy of material contained in the shaft and a nearby wet silo at the site. Energy Minister John Battle said: "It is now clear that the shaft does not provide standards of waste disposal that are acceptable today and that retrieval is the best practicable environmental option. This decision has been taken following detailed engineering studies completed recently by the UKAEA, which have shown that it is now technically feasible to recover waste from the shaft in a safe and environmentally acceptable manner.

"Retrieval and treatment will provide a long term solution to the problem of what to do with the waste placed in the Shaft and Wet Silo over the last four decades which has caused such concern to the public".

Mr Battle added that "there are significant uncertainties about the costs", with the most recent estimates suggesting something like £215 to £355 million over the next 25 years.

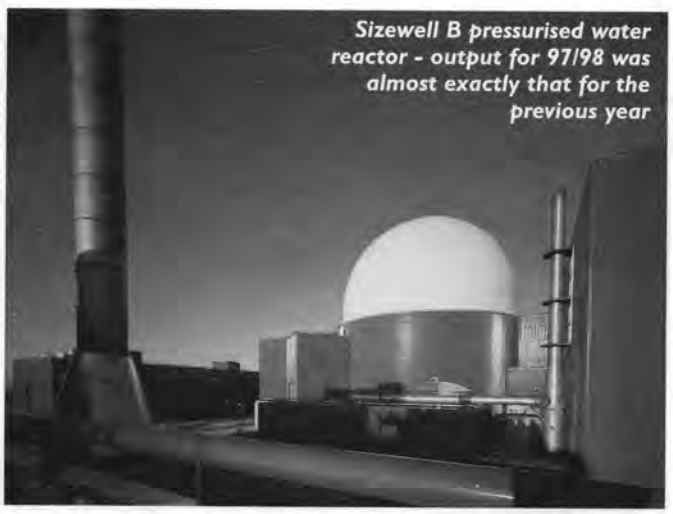
Nuclear stations maintain performance despite outages

British Energy's annual output summary for its power stations shows that the total output for 1997/98 was down only 0.8% on the previous year, despite having seven statutory outages, three more than in the previous year. Four stations - Hunterston B, Heysham 1, Hartlepool and Sizewell B - achieved new output records, the company adds.

The table lists output sold to customers from the company's power stations in March and for the full 1997/98 financial year, together with comparative data for the previous financial year.

On-load refuelling was restored at both reactors at Heysham 2 and one reactor at Torness, with on-load refuelling on the other due to be restored in the 1998/99 financial year. At Dungeness B, due to the impact of both prolonged statutory outages and unplanned outages, output was down significantly in the second half of the year.

Based on the current fossil fuel generation mix, the nuclear plants have saved 51 million tonnes of CO_2 - equivalent to about half of the total UK vehicle emissions, says British Energy.



Sizewell B pressurised water reactor - output for 97/98 was almost exactly that for the previous year

	1996/97		1997/98	
STATION	**March(TWh)**	**Full year(TWh)**	**March(TWh)**	**Full year(TWh)**
Hinkley Point B	0.82	8.14	0.43	8.32
Hunterston B	0.79	8.03	0.85	8.73
Dungeness B	0.18	6.68	0.18	4.71
Heysham 1	0.70	8.19	0.73	8.86
Hartlepool	0.44	8.63	0.89	8.88
Torness	0.91	9.65	0.94	9.27
Heysham 2	0.53	9.44	0.87	9.43
Sizewell B	0.88	8.45	0.89	8.46
Total sales to customers	5.25	67.21	5.78	66.66

Renewable energy in lessons for the future

Demand for power in many developing countries is increasing. In some countries it outstrips supply, hindering potential economic development. Shortages are particularly acute in rural areas, where the agricultural sector is leading the way towards higher per capita incomes. Higher populations and greater development needs are set to compound the problem, as the conventional means of supplying power to rural areas - through extension of the centralised grid - is fraught with inefficiencies. Yet these are the very places where it would be most cost-effective to harness renewable energy sources such as hydropower, windpower, solar energy and biomass. However, utilisation here remains low despite costs reducing significantly over the last 20 years. Using India as an example how substantial progress can be made, this article examines some of the reasons for the low take up of renewable technologies.

Inside a traditional Indian watermill. The top mill-stone is connected to a crude waterwheel which is powerd by the impact of water falling through 3 or 4 m. Photo: IT Power

Kyoto called for action over the next decade to lessen the impact of global warming. However, the world's economy depends heavily on fossil fuels, which account for around 85% of commercial primary energy consumption. Countries such as India and China, which have vast indigenous coal reserves, are quite naturally reluctant to undermine economic growth by cutting the use of fossil fuel. Like other developing countries, their per capita consumption is still very low in comparison to those of Organisation for Economic Cooperation and Development (OECD) members, on average by a factor of ten. Although all countries were asked to submit serious proposals to Kyoto in December last year, only the developed nations agreed to commit themselves to a six per cent reduction in emissions below 1990 levels between 2008 and 2010.

Given current rates of economic growth in many developing countries and their increasing per capita primary energy consumption, they will soon need to curb their emissions. The International Energy Agency forecasts that they will be responsible for almost half the world's carbon emissions in 2010, compared to just 16% in 1970.

Action needs to be taken now to create a world economy that is not so reliant on fossil fuels. Most analysts agree that oil reserves may soon start to dry up, and that both oil and natural gas may be in short supply by the mid-21st century.

Two broad approaches could lead to a sustainable energy future. (The Brundtland Commission's widely quoted definition of sustainable development is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.) Energy efficiency measures could be applied to fossil fuel use to cut carbon dioxide emissions, and renewable energy sources could be used. Harnessing renewable energy sources should also be a key aim, particularly for those industrialising

developing countries:

by Dr. C J Marquand, Professor J C McVeigh and Sanjev Sehgal, University of Westminster

countries in the process of developing fossil fuel dependent economies.

Renewable energy in developing countries

Three niche opportunities exist for renewable energy technologies to generate power and create a sustainable energy mix in developing countries:

- Where a large region needs an electricity supply to sustain economic development - or, in the case of the agricultural sector - to promote economic development, demand can be met locally and incrementally through 'distributed generation'.
- When a very remote and sparsely populated region needs an electricity supply, often for agricultural reasons, stand-alone renewable energy technologies may be the most cost-effective option for applications such as pump-set energisation or windmill irrigation.
- In some countries, such as Kenya, small privately-owned PV units have been relatively successful. Interest is growing in large-scale stand-alone units serving expanding, yet remote communities requiring refrigeration for vaccines, lighting and communication projects for schools and other institutions, electric fencing and the full range of domestic services.

As well as curbing greenhouse gas emissions, harnessing renewable energy sources has many other advantages:

- reducing local and trans-boundary pollution
- reducing the burden on non-commercial biomass resources
- offering cost-effective alternatives to conventional power stations in rural areas
- addressing power shortages in developing countries
- providing an opportunity to plan and control developing electricity supplies to rural areas, with growing contribution from renewable energy sources
- decreasing dependence on imported fuels, and their volatile and unpredictable prices.

Photovoltaic module charging a lead-acid battery for use as a household lighting system in a remote Himalyan vilage in India. - Photo: IT Power

The role of government

Past experience suggests that a great deal of planning and patience are required in promoting the use of renewable energy technologies in developing countries. It also takes time, as people generally resist change. Dissemination through trust and experience is the only route.

However, when people in rural areas start to earn higher incomes - currently the case in countries such as India - they become more willing to invest in cost-effective technologies. The will is even stronger when the technology has been tried and tested. Even though many rural areas do not initially reap the benefits of access to renewable energy technologies providing power to the grid (because they are not connected), the fact that the technology is prominent means that it is usually only a matter of time before it is adopted in different ways, and adapted to suit local needs.

Numerous examples of mainstream technologies - originally designed for large-scale use - have been adapted by entrepreneurs and opened up to more rural and/or poor people. Critics have suggested that, far too often, technologies such as solar ovens or energy efficient stoves have been introduced in rural areas through aid programmes, without heeding local requirements. Fragmentation and difference between areas, even within villages, has meant that technologies that do not exactly match local needs have been doomed to fail.

The Indian government has recently launched a mission to increase the use of the country's rich renewable energy sources in power generation by liberating the power sector to private participation. Its decision is based purely on economic, rather than ethical grounds, in that renewables can make up some of the present deficit between installed capacity and power demand - which is currently increasing at 9% per annum - more effectively than conventional means.

Private power would inevitably mean higher tariffs than public power, because there

would be fewer, or possibly no, subsidies. This makes the power sector more sustainable in the long term, since prices reflect the cost of supply. In India's case, policies explicitly favour those who invest in renewable energies, particularly foreign investors. However, incentives for private investors must be underpinned by general awareness of environmental issues and the benefits that can be gained by harnessing such energies.

Wind power in India

There are many geographical pockets in India where conditions are suitable for generating wind power. Favourable locations tend to be concentrated in the west and the south of the country. It is significant that the cost of wind-powered electricity is believed to compare favourably with that produced by new thermal power plant, and great efforts are being made to maximise capacity. By 2000, India aims to be using more wind power than any other country in the world, with a target capacity of 2,900 MW, compared to the target of 2,800 MW in the US. This is more than 65 times the installed capacity in 1993, around 3.6% of the current installed capacity (81,000 MW) and more than 10% of the total known potential of the country's wind power of 20,000 MW.

Even though windpower will not make a significant contribution to India's total power requirements in the near future, the target of 2,900 MW certainly appears achievable in the light of the government's recent moves to encourage foreign investment. Problems that have surfaced for foreign companies in large thermal and hydro power projects do not affect smaller ones. Financial incentives offered by the Government of India have already netted more than 1000 MW in private sector proposals. Interestingly, much of the foreign investment is coming from British-based companies, encouraged by the Indo-British Partnership Initiative (IBPI) established in 1993.

Progress and diversification in other renewables

India has taken the lead among developing countries when it comes to tapping the enormous potential of renewable energy sources. By the year 2010, the projected percentage of total installed capacity is 5% (10,000 MW). By 2020, when it is generally considered that renewable will just start to compete economically with conventional fuels, even without any added external costs, the estimated contribution will be 10% (50,000 MW).

Many economic and non-economic barriers have yet to be removed, but India has shown that the regulated participation of the private sector can work. Measures which could lead to higher penetration of renewable in the grid connected mode have been suggested by several studies. These include strengthening renewable energy databases, moving away from the nuclear option, increased hydro capacity, flexible linked capacities involving distributed generation, and optimising renewable technological devices for local conditions.

The government initiative has also sparked more diverse applications, such as:

- Making India the largest producer of PV modules in the developing world, with more than 3 MWp of modules manufactured 1992. Applications include lighting systems, water pumps, community systems, rural education television, vaccine refrigerators, telecommunication repeaters and navigational aids, and power packs for rural telephone use.
- Plans for a 150 MW solar plant on a 3,000 acre plot in Rajasthan's Thar desert by an Enron-Amoco joint venture. Though dogged by political problems, it looks set to go ahead, bringing power on line at a rate of 10 MW a year.
- Increasing solar oven sales and more solar water heaters in domestic, community and industrial settings. Several solar thermal power plants have been installed. Solar thermodynamic (heat engine driven) water pumps have also been developed through an Indian-German cooperation programme.
- Using windpower for pumping water. Most pumps produced to date have been for shallow wells, but deep-well pumps suitable for village water supply have been developed and sales are beginning to grow.
- The development of small hydro has been slower than expected, but major efforts are forecast. Developing 'mini-hydels' up to 3 MW capacity on canal drops, dam toe and river run-off sites, and decentralised generation have raised considerable interest.
- India is also at the forefront of biomass technology development. The National Biogas Programme has seen the promotion and dissemination of biomass gasifier technology to power modified internal combustion engines (to drive generator sets and water pumps) and external combustion engines.

Thanks to government support, India's renewable energy market is expanding. Crucially, the market is fuelling its own growth, with technologies being developed to become more versatile and are being adapted to suit local needs.

The way forward

The future of the energy supply mix is extremely difficult to predict, but it is clear that there will be an inevitable shift towards harnessing renewable energy sources during the 21st century. Renewable energy technologies are likely to be adopted in rural areas of developing countries, given the complications and costs associated with providing access to grid power. While the previous policy of the World Bank identified conventional large-scale projects as the most cost-effective options for providing extra capacity in developing countries, their new Photovoltaic Market Transformation Initiative and the Solar Development Corporation could result in rapid PV commercialisation.

This article has highlighted India, both because of its current power problems and radical moves that the government has made to encourage the use of renewables. India's experience has proved that, once a technology is seen to be tried and trusted, it can be adapted by domestic companies and used in different applications. Most importantly, the market becomes self-propelling.

The article is abridged from a paper by the same authors: Dissemination of renewable energy technologies - lessons for the future, which was published in the International Journal of Ambient Energy.

Presidential Review 1997

A famous Chinese curse states: 'May you live in interesting times'. Fortunate to assume office at a time when the momentum and renewal of the Institute was accelerating, this Presidential year has certainly been most interesting! The year began with the celebration of the Institute's 70th birthday in some style at the Annual Luncheon in April with 260 guests.

The Institute's staff, our key resource, underwent very considerable change. Only four of the nine staff members serving in early 1998 had been in post a year earlier. A number of long-serving staff left the Institute immediately before my Presidency. Another, Jim Leach - the Secretary of the Institute since 1992 - took early retirement in August 1997 as a result of ill health. We are grateful for his sterling efforts and wish him a long, well-earned retirement.

Following re-designation of the post, and national advertising, Diane Davy agreed to take up the post as the new Secretary and Chief Executive with effect from January 1998. Louise Evans served with very considerable distinction and enthusiasm as Acting Secretary in the long interregnum. We all thank her most sincerely. With other recent appointments, especially to reinforce our membership services, events and education services, the Institute is now well equipped to face the future. Further boosting the competence and confidence of the staff is the aim of recent decisions to follow the Investors in People programme and to ensure the staff are empowered to play a full role in committee deliberations and implementation.

All involved in HQ activities have contributed to change and renewal in numerous other ways. As for communications, our monthly magazine Energy World has been pleasingly refreshed; more work on it is now handled in house; increasingly greater use is made of electronic communication via e-mail and a web site; IT equipment and crucial databases are being upgraded; and it is planned that the Yearbook will be re-introduced this autumn of 1998. Committee structures are under review to enhance their effectiveness, aid internal communication and speed decision making. Working links with Government, Parliament, other national agencies, companies, fellow Institutes and the Engineering Council have been much enhanced.

Too many London-based organisations are prey to the 'us and them' syndrome between their HQ and regional structures. My predecessor, Peter Johnson, was determined to strengthen branch links and services. This commitment has been honoured. I have much appreciated the very considerable energy and enthusiasm of branch officers and their committees, whose efforts are too often overlooked. I thus fully support the recent decisions the Council has taken to reinforce interaction with, and services for, all branches. As a High Street bank once claimed: 'Our roots are our branches'. We forget this at our peril.

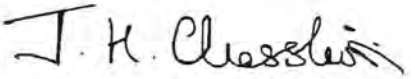
Our membership is distinguished, but it is ageing. Perhaps of greatest importance for the longer-term prospects of the Institute was the Privy Council's approval to an amendment in the Bye-laws to permit a new route to a grade of membership. This is enabling the Institute to launch a major recruitment drive amongst energy managers and those others engaged in all aspects of energy efficiency and building and environmental services.

The Institute is proud of its engineering tradition and strength amongst energy suppliers. But we all recognise the Institute is also supremely well-placed to recruit across a wide range of disciplines and skills associated with all facets of the energy sector. We plan to greatly improve links with colleges and universities. Our highest priority for 1998 is membership expansion and enhancing service provision for existing individual and Group Affiliate members.

Those aspects of our role as a learned society and provider of technical advice and support, both at home and abroad, will receive more attention next year. Workshops, conferences and brainstorming activities have been well received but will be developed further. We have much to contribute to curriculum development and training packages at all levels, from the shop-floor to the boardroom. Our role in accreditation has great potential to boost national and corporate performance in energy, environmental and training matters. This is one crucial route to ensure we are seen as THE Institute of Energy.

As your President, I was privileged to participate in the Prime Minister's 'Green Summit' attended by many of the Cabinet and held at 10 Downing Street immediately before the Kyoto Conference in early December. The 1998 Melchett Lecture, to be given by Dr Brenda Boardman of the Environmental Change Unit, University of Oxford, will further develop some imperatives for the post-Kyoto energy agenda.

In short, an exciting year - especially for a mere economist! I thank all of you who have contributed, in so many different ways, to project the Institute as a vibrant, yet lean and hungry, organisation; capable of adaptation, change and renewal; of real value to its members by enhancing their interests and professional status; and contributing effectively to significant public policy debates. Finally, I wish the incoming President, Mark Baker CBE, every success for another 'interesting' year in office.



John Chesshire

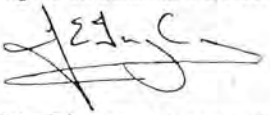
Statement of the Trustees

The summarised financial statements for the year ended 31st December 1997 set out on pages 14 to 15 are a summary of information extracted from the annual accounts which may be obtained, together with the reports of the auditors and trustees, on application in writing to the Secretary and Chief Executive at 18 Devonshire Street, London W1N 2AU.

These summarised financial statements may not contain enough information to allow for a full understanding of the financial affairs of the Institute. For further information the full annual accounts, the auditors' report on these accounts and the trustees' annual report should be consulted.

The annual accounts were approved on 11 May 1998, will in due course be submitted to the Charity Commission, and have been audited by Messrs Lawford Kernon & Co.

Signed on behalf of the trustees



John E Ingham Honorary Treasurer

Statement of Financial Activities

INCOME AND EXPENDITURE	notes	Year ended 31 December 1997 Unrestricted Funds £	Restricted Income Funds £	Endowment Funds £	Total Funds £		Year ended 31 December 1996 Unrestricted Funds £	Restricted Income Funds £	Endowment Funds £	Total Funds £
Incoming resources										
Subscriptions		255,309				280,959				
Less: receivable in advance		(12,600)				(39,334)				
		242,709			242,709		241,625			241,625
Project and training event management	1	242,329			242,329		154,965	7,432		162,397
Conferences	2	5,730			5,730		46,674	2,500		49,174
Journal and other publications		86,583				66,199				
Less: receivable in advance		(30,839)				(21,506)				
		55,744			55,744		44,693			44,693
Branch income - local activities	3	19,958			19,958		24,051			24,051
Investment income	4	18,832		2,038	20,870		20,938		2,212	23,150
Rental income		11,667			11,667		11,100			11,100
Royalties - FACTS		4,996			4,996		4,562			4,562
Educational income		3,980			3,980		4,107			4,107
Donations	13		500	125	625			600	175	775
Annual Lunch		4,910			4,910		4,416			4,416
Melchett Lecture		4,000			4,000		2,100			2,100
Miscellaneous income		2,132			2,132		8,372			8,372
TOTAL INCOMING RESOURCES		616,987	500	2,163	619,650		567,603	10,532	2,387	580,522
Direct Charitable Expenditure										
Project and training event management	1	131,654	5,865		137,519		84,995	1,567		86,562
Conferences	2	14,752			14,752		16,860	2,500		19,360
Journals and other publications		94,248			94,248		52,476			52,476
Branch expenditure	3	32,512			32,512		41,098			41,098
Educational		1,955			1,955		1,235			1,235
Annual lunch		7,436			7,436		5,057			5,057
Melchett Lecture		2,309			2,309		2,367			2,367
Awards	13	56	553	6,264	6,873		500	1,100	6,200	7,800
		284,922	6,418	6,264	297,604		204,588	5,167	6,200	215,955
Other Expenditure										
Publicity		8,179			8,179		4,356			4,356
Administration										
Salaries and related staff costs	5	258,723			258,723		185,885			185,885
General communications	6	58,889			58,889		65,766			65,766
Accommodation and related costs	7	24,117			24,117		23,317			23,317
Professional	8	11,604			11,604		11,383			11,383
Other	9	17,330			17,330		21,408			21,408
		378,842			378,842		312,115			312,115
TOTAL RESOURCES USED		663,764	6,418	6,264	676,446		516,703	5,167	6,200	528,070
NET INCOMING/(OUTGOING) RESOURCES		(46,777)	(5,918)	(4,101)	(56,796)		50,900	5,365	(3,813)	52,452
OTHER RECOGNISED GAINS AND LOSSES	14									
Investments										
Realised gain		7,817			7,817		(6,056)			(6,056)
Unrealised gain		59,308			59,308		16,496			16,496
Release of Development Fund		(11,500)			(11,500)					
		55,625	-	-	55,625		10,440	-	-	10,440
NET MOVEMENT IN FUNDS		8,848	(5,918)	(4,101)	(1,171)		61,340	5,365	(3,813)	62,892
Total funds at 1 January 1997 (as restated)	15	464,486	9,908	41,596	515,990		403,146	4,543	45,409	453,098
TOTAL FUNDS AT 31 DECEMBER 1997	15	473,334	3,990	37,495	514,819		464,486	9,908	41,596	515,990

No operations were aquired, commenced or discontinued during the above two financial years.

The Institute of Energy

Balance Sheet as at 31 December 1997

	notes	1997 £	1997 £	1996 £	1996 £
Fixed Assets					
Tangible fixed assets	10	62,178		68,651	
Quoted investments	11	453,384		378,724	
			515,562		447,375
Current Assets					
Stocks of Ties, Shields & Medals		2,940		4,786	
Debtors	12	49,987		40,544	
Bank balances and cash		77,923		156,493	
		130,850		201,823	
Liabilities falling due within one year					
Income received in advance		65,075		72,072	
Creditors and accrued expenditure		62,249		56,701	
Institute of Energy Benevolent Fund		4,269		4,435	
		131,593		133,208	
Net current assets (liabilities)			(743)		68,615
Total assets less current liabilities			514,819		515,990
Representing:					
Capital funds - Endowments	13		37,495		41,596
Income funds - Restricted	13		3,990		9,908
- Unrestricted					
- Designated funds	14	35,292		38,723	
- Revaluation reserve	14	119,836		75,436	
- Accumulated fund	14	318,206		350,327	
			473,334		464,486
Total funds	15		514,819		515,990

Approved By:

J. K. Chesshire President

.....Honorary Treasurer Dated 11/5/1998

Statement by the Auditors

In our opinion the summarised financial statements of The Institute of Energy for the year ended 31st December 1997 on pages 14 to 15 are consistent with the full annual accounts on which we gave an unqualified opinion on 11 May 1998.
Lawford Kernon & Co. Chartered Accountants and Registered Auditor.
11 May 1998.

Accounting Policies

1. Accounting convention

The accounts are prepared under the historical cost convention, modified by the inclusion of quoted investments at market value; with the application of the fundamental accounting concepts of going concern, accruals, consistency and prudence; and in accordance with applicable Accounting Standards and Statement of Recommended Practice 2.

2. Depreciation of tangible fixed assets

Tangible fixed assets are stated at cost less depreciation. The costs of leasehold property and improvements thereon are depreciated evenly over the term of the lease (expiring in 2009) and its carrying value does not necessarily represent the market value. Other tangible fixed assets are depreciated on a straight line basis over their estimated useful lives at the following rates:

Fixtures and fittings	10%
Electrical equipment	25%

3. Quoted Investments

Quoted Investments are included at market value, calculated on a portfolio basis. Gains and losses on realisation are recognised in the year they arise. Proceeds from sales of investments are reinvested by Singer and Friedlander Investment Management Limited on behalf of the Institute and are included in their portfolio of investments.

4. Branches

The accounts incorporate branch transactions including those arising in respect of funds generated by the branches themselves.

5. Development fund

This is funded by transfers from the Accumulated Fund, either directly or by allocation of a proportion of Project Income, and expenditure of a developmental nature is, where so authorised by Council, supported from this fund.

6. Liability for dilapidations at expiry of lease

An amount equal to the estimated unprovided dilapidations at each year end divided by the number of full years remaining on the lease is set aside by annual transfer from the Accumulated Fund to the Dilapidations Fund. Council estimates that at 31 December 1997 prices, the potential liability for dilapidations at the expiry of the lease in July 2009 is £120,000 and accordingly £8,125 has been transferred to the Dilapidations Fund. (1996: £8,500)

7. Pension Arrangements

The Institute contributed in the year to personal pension plans for eligible employees, and also to a superannuation scheme, both funded on a money purchase basis and invested in insurance policies. Contributions are charged as expenditure in the year they fall due. All funds are independently administered.

8. Engineering Council fees

The Institute acts as collecting agent for the Engineering Council in respect of fees, and accounts to it for such fees on the basis of annual estimates which are subsequently adjusted to actual. Fees collected in the year were £42,767 of which £1,936 was collected in advance at 31 December. Fees paid over to the Council were £40,352 which is after adjusting for £2,086 of fees in respect of 1996. Balances between the Institute and the Council and amounts received in advance are included in debtors and liabilities due within one year as appropriate.

The Institute of Energy Benevolent Fund

ACCOUNTING POLICIES

1. Accounting convention

The accounts are prepared under the historical cost convention, modified by the inclusion of quoted investments at market value; with the application of the fundamental accounting policies of going concern, accruals, consistency and prudence; and in accordance with applicable Accounting Standards and the Statement of Recommended Practice 2.

2. Investments

Quoted investments are included at market value, calculated on a portfolio basis. Gains and losses on realisation are recognised in the year they arise. Proceeds from sales of investments are reinvested by Singer and Friedlander Investment Management Limited on behalf of the Benevolent Fund and are included in their portfolio of investments.

The Institute of Energy Benevolent Fund Statement of Financial Activities

	note	Year ended 31st December 1997 Unrestricted Funds £	1996 Unrestricted Funds £
INCOME AND EXPENDITURE			
Incoming resources			
Donations and bequests		815	5,078
Ties and shields	1	167	164
Investment income		1,629	2,004
TOTAL INCOMING RESOURCES		2,612	7,246
Direct Charitable Expenditure			
Assistance to members		2,105	500
Other Expenditure - Administration			
Investment managers' fees		546	427
Miscellanous expenses		-	32
		546	459
TOTAL RESOURCES USED		2,651	959
NET INCOMING/(OUTGOING) RESOURCES		(39)	6,287
OTHER RECOGNISED GAINS AND LOSSES			
Investments			
Realised loss		(1,166)	(451)
Unrealised gain		11,017	220
		9,851	(231)
NET MOVEMENT IN FUNDS		9,812	6,056
Total funds at 1 January 1997		75,565	69,509
TOTAL FUNDS AT 31 DECEMBER 1997		85,377	75,565

No operations were aquired commenced or discontinued during the above two financial years

The Institute of Energy Benevolent Fund Balance Sheet as at 31 December 1997

	note	1997 £	1997 £	1996 £	1996 £
Fixed Assets					
National Savings deposit bonds		8,890		8,386	
Quoted investments	2	66,446		59,441	
			75,336		67,827
Current Assets					
Debtor - The Institute of Energy		4,269		4,435	
Cash on deposit		4,099		2,457	
Cash in bank current account		1,673		846	
Net current assets			10,041		7,738
Total net assets			85,377		75,565
Representing:					
Unrestricted funds					
- Accumulated fund			66,992		63,757
- Revaluation reserve			18,385		11,808
			85,377		75,565

Approved on behalf of the Trustees

Honorary Treasurer Dated 11 May 1998

STATEMENT BY THE TRUSTEES

The summarised financial statements for the year ended 31st December 1997 set out on this page are a summary of information extracted from the annual accounts which may be obtained, together with the reports of the auditors and trustees, on application in writing to the Secretary & Chief Executive at 18 Devonshire Street, London W1N 2AU.

These summarised financial statements may not contain enough information to allow for a full understanding of the financial affairs of the Benevolent Fund. For further information the full annual accounts and the trustees' annual report should be consulted.

The annual accounts were approved on 11 May 1998 and will in due course be submitted to the Charity Commission, and have been audited by Messrs. Lawford Kernon & Co.

signed on behalf of the trustees

J E Ingham Honorary Treasurer
11 May 1998

STATEMENT BY THE AUDITORS

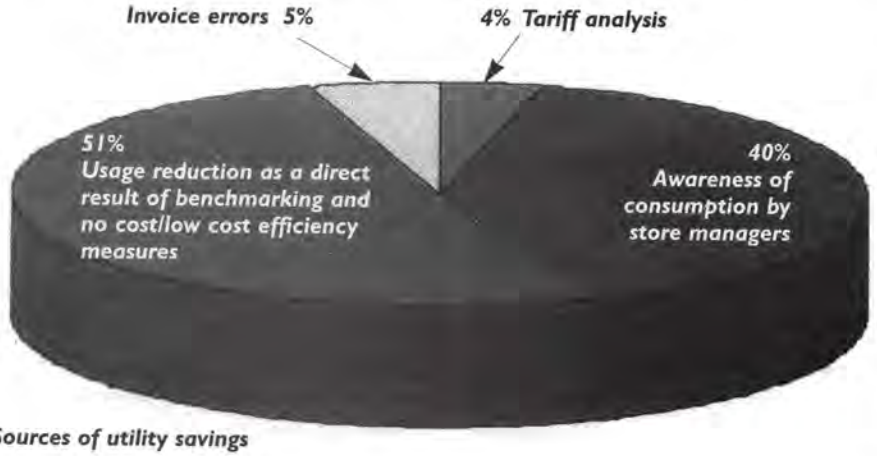
In our opinion the summarised financial statements of The Institute of Energy Benevolent Fund for the year ended 31st December 1997 as set out on this page are consistent with the full annual accounts on which we gave an unqualified opinion on 11 May 1998.

Lawford Kernon & Co. Chartered Accountants and Registered Auditor.
11 May 1998.

Exporting M&T services to the US

by Duncan McDermott, Diector, EnTech Energy Consultants

UK energy management consultant EnTech has signed a unique deal to offer expertise, technical support and back up for energy management to clients of US consultant Illinova. EnTech's Duncan McDermott reports on how the UK's lead on energy market liberalisation has given his company an opportunity to export its services.



Sources of utility savings

The reason why such a deal took place is that the UK is widely regarded as the world leaders in the provision of software and services to track, manage and report on energy consumption and costs. Although a kilowatt-hour is essentially the same throughout the world, the approach to managing use has varied considerably from country to country.

Historically in the UK, organisations have embarked on energy management schemes to reduce operating costs as well as demonstrate their commitment to improving the environment. Most large companies have taken the initiative themselves and implemented successful energy management policies. These policies are founded on the ability to identify where energy is being used, monitor consumption levels and analyse consumption trends - in essence, the standard monitoring and targeting techniques. Armed with management information and the ability to do like- for-like comparisons between sites, engineering solutions are found for consumption problems. Little, if any, pressure has been applied by utility companies to encourage customers to use less power, except in the case of very large energy users.

However, in the US utility companies have actively worked with energy users to use less power as it was in the electricity company's interest not to have to build more power stations. This meant that energy managers were more involved with their utility companies, working on local site-specific projects. Therefore, there was less need for consumers to look at their big picture of company-wide performance. This situation is now changing as America moves towards full electricity and gas deregulation and multi-site organisations realise the importance of having detailed information on how they use energy.

The reason that EnTech is able to provide services and expertise to the American market is that the UK has already gone through (well, partially) the deregulation process. The company has worked with large organisations to develop software and services, to help them in both energy management and energy purchasing.

These services revolve round the ability to monitor where energy is used and analyse consumption trends. The prime (and the most economical) source for this data is from energy invoices. By using monitoring and targeting software, companies can enter consumption and cost data themselves or outsource the operation of it to a third party - a bureau service.

The benefits to UK companies from good analysis of energy data are great. The chart shows the areas where typical savings from good energy management practices can be made. EnTech's UK customers typically recoup between 1 and 2% of their total energy spend in identified invoice errors; adding other billing anomolies can take this up to 5%. Information received by customers includes energy reports highlighting sites that potentially have a problem. These, in turn, motivate staff to take responsibility for their energy use and give them the data necessary to intelligently purchase power in the open market. Other benefits include the streamlining of accounts procedures in paying energy bills.

Surprisingly, the concept of M&T in the US is relatively new. A couple of software packages have been around since the mid-1980's but none are as sophisticated as those available in the UK. With the approach of deregulation, there is now a greater demand for software and the services to operate it. However, only a handful of American companies have the experience or track record in delivering such services. Not wanting to re-invent the wheel, Illinova turned to EnTech.

The Bureau services that we are offering Illinova's US customers are basically the same as those offered to their UK customers:

- processing of energy invoices prior to payment
- validation of these invoices and resolution of invoice errors
- establishing automated links with customers' accounts payable systems to initiate payments
- production of energy management reports
- production of energy accounting reports
- having accurate data available to purchase energy more effectively.

Contact EnTech, tel: 0171 833 3353, fax: 0171 833 2340

The impact of the Asian financial crisis on energy projects

by Simon Outram, Espicom Business Intelligence

What does the Asian economic crisis mean for the power industry? The simplest, and probably most honest answer is that, at the moment, we do not know.

Early in 1997 it was becoming clear to financial experts, if not to the rest of us, that something had to give in South East Asia. The Tiger economies were dieting on a menu of high borrowing, low interest rates and GDP growth rates that led the world. Infrastructure development was booming, stimulated by a growth in population and, more particular, a rise in living standards. The requirement for new power capacity continued at a pace matching, if not exceeding GDP as the power industry struggled to keep up with demand.

In April 1997, Japan, the key economic force in the region, suddenly hit a block to its tentative five year recovery. Having spent years as the butt of resentment for its success, Japan was just getting used to the quiet life of only minor economic growth, the country was now catapulted into the headlines as it spun into recession. Japanese banks began to call in debts on its Asian neighbours which in turn started to collapse, at least in the financial sector.

In October 1997 the region's economies started to collapse, turning all economic forecasts upside down. The downturn itself was led by Thailand, Indonesia, and the Philippines, although no country was unaffected. South Korea followed and several high profile and tragic company collapses began in Japan. Overall the region continues to suffer, although the free fall of currencies on the world exchange has been halted.

As the region wakes up after what appears to be some kind of nightmare, there are some signs of hope. Weak currencies are good for exports and economic collapse is supposed to sharpen up economic practice. The harsh realities of collapse may result in local companies and governments being less hostile to foreign investment and more flexible in work practices. Whether such economic toughening up is a good thing must be left to others to debate.

In the power industry, the crisis could be said to have provided the following positive drivers:

- a need for major investment to build the power plants which were already scheduled - similar to the situation which has occurred in South America where power plants and power companies are now up for grabs,
- a desire to decrease the control on the power industry by the state which has been weakened significantly, and
- an increase in independently financed and run power stations.

Unfortunately the crisis has in the short-term severely dented optimism with a number of power projects having been axed or delayed; approximately half the projected 11,000 MW planned for the Philippines for example. However, in Japan demand for electricity rose in February by some 1.7% over the previous year. While industrial demand fell slightly this low but steady growth could well be the pattern of the future.

But this is only anecdotal evidence and cannot attempt to supply the bigger picture. No government is likely to advertise the halting of major energy projects and investigation into the current status of projects has only come up with the answer that the programmes for expansion are still on track. However, for the present is it safe to assume that many power projects will be put on hold while governments' search for a suitable financial base to purchase the power provided. The obvious incompatibility between previous GDP forecasts and revised estimates will undoubtedly alter the market, but with so much of Asian infrastructure still having to catch up with its economic growth of the past the pace of demand is likely to remain feverish.

India looks at vegetable waste-to-energy possibilities

The Indian government has appointed AEA Technology to investigate the economic and commercial prospect of generating electricity using vegetable market waste.

India's Ministry of Non-Conventional Energy Sources awarded a contract to the company to carry out a study at Azadpur market in Delhi and Koyambedu market in Chennai (formerly Madras). India has a shortfall of power and some factories are not able to operate to their full capacity because they have to save electricity. There is also a problem with waste as the population in the large cities continues to increase.

Experts at AEA Technology believe the Delhi market, currently known to produce around 150 tons of waste per day, could produce up to one megawatt of electricity and power around 5,000 homes. The Chennai market produces around 30 tons of waste per day (200 kW).

The technology being examined is primarily anaerobic digestion; also referred to as biomethanation or biogas technology. Slurried vegetable waste processed through air-tight biomethanation reactors produces a mixture of methane and carbon dioxide which can be used to generate electricity. AEA Technology has many years' experience with this technology in Britain where water companies and industry use a variety of waste to recover and use energy. The advantage of wastes from fruit and vegetable markets is that they do not contain any toxic waste, so the residue left after biomethanation, can be used as compost.

AEA Technology is working closely with India's National Environmental Engineering Research Institute to verify the quantities and composition of the waste generated from the markets.

India is committed to recovering up to 1,700 MW of energy using biomethanation technology and the study being carried out by AEA Technology could become a blueprint for the future.

Governments 'should rely on the private sector' to meet increases in global energy consumption

The G8 Energy Ministerial Business Consultative Meeting held in Moscow earlier this year and organised by the world Energy Council (WEC), called on Governments increasingly to rely on the private sector to provide the energy supplies to meet the expected 55% growth in global energy consumption between now and 2020.

It also advocated moves to improve the access to commercial energy for the 2 billion people, mainly in south Asia and sub-Saharan Africa, who are currently without it.

The growth in energy consumption is expected to be concentrated in the developing countries and met predominantly from fossil fuels.

The major trend of the last decade has been of progressive liberalisation in the global energy sector with governments quitting being producers of energy. Diversity of energy supply in a market-orientated environment should provide adequate security of supply in most circumstances, says the WEC.

Governments are therefore now free, if they choose, to concentrate on their core responsibilities. These include the provision of commercial, regulatory and environmental legal frameworks which are transparent, effective, fair and stable, and the maintenance of a healthy economy.

Governments should avoid arbitrary intervention in energy markets and end national preference.

This message was passed to the G8 Energy Ministerial Meeting which took place in April in Moscow. Other key messages passed to the G8 Energy Ministers included:

- Almost all the $20-30 trillion estimated by the WEC to be required for global energy investment over 1990-2020 will have to come from private sources. In principle, global capital resources are more than adequate for this. However, sufficient capital is unlikely to be mobilised unless the Governments of many developing countries and economies in transition concentrate on their core responsibilities and provide a clear, consistent and stable financial environment conducive to the development of domestic capital markets and the attraction of inward investment.
- In many countries energy subsidies cause huge inefficiencies in the production and use of energy, adverse environmental effects, and returns on energy investment to be unattractive to private investors. Government-controlled agencies, through subsidising energy prices, send out the wrong signals. Governments accordingly need to phase out energy subsidies where they exist, and tackle poverty by other means.
- Particular environmental problems associated with energy use call for particular solutions. However, in general governments should seek to encourage greater energy efficiency, the wider commercialisation of renewable energies, education and information campaigns about the benefits and costs of all energy forms, and the faster diffusion of the most efficient energy technologies to the developing countries and economies in transition. Nuclear power offers significant benefits in terms of abating global warming and diversity of energy supplies. But fuller attention needs to be given to waste management and proliferation issues before public confidence can be increased.
- In making their decisions Governments should use a lifecycle cost/benefit approach, and consult industry and consumers. Government environmental regulation should concentrate on objectives rather than means, use economic instruments in preference to regulation where possible, and as far as fiscal interventions are concerned be tightly targeted and time limited.

Mr John Baker, the Chairman of the WEC Executive Assembly said: "The business community welcomes the initiative of the G8 governments to dialogue directly with the energy industry in order to address together the challenges facing the global energy sector. We believe that these can only be met through a constructive partnership between the public and private sector".

Mott MacDonald has won the Queen's Award for Export Achievement for the second time in three years, mainly for its consultancy work for new private power developments, including work in Morocco, Africa and China. It has also helped to restructure the electricity industries of the Ukraine and the Philippines. The company played a key design and construction supervision role on several components of the Lesotho Highlands Water Project, including the 'Muela Dam and hydropower station (pictured) plus a 34 km delivery tunnel from Lesotho to South Africa.

Guaranteed energy

by Nicci Griffiths, National Energy Services Ltd

The National Home Energy Rating (NHER) scheme has come a long way since the early days when it was first used to measure the energy standards of homes built for the Milton Keynes Energy Park. Nicci Griffiths reports.

A perfect '10' for this Westbury house in Milton Keynes

The National Home Energy Rating (NHER) scheme has now been operating since 1990 and has more than 1500 members organisations employing between them over 3000 qualified Assessors. Today it is firmly established as the leading energy rating and is a commonly used term in the vocabulary of housing professionals.

Why has the NHER been so successful and who exactly uses it? Quite simply, the NHER provides access to a whole mine of information about the way homes and their occupants use energy. This information can then be used to design energy efficiency into new homes and devise cost-effective improvement programmes across whole housing stocks.

SUPPORTING SOCIAL HOUSING

If any one area of the industry has embraced the NHER, it is the social housing sector. Local authorities in particular have been using the NHER since long before the introduction of the Home Energy Conservation Act (HECA). The NHER supported the early Greenhouse Programme bids where councils needed to be able to justify spending programmes on the basis of cost effectiveness, and show actual progress through monitoring.

Energy rating is now a fundamental part of these Goverment housing programmes and the NHER's application has now spread to include HECA where it supports a whole range of activities associated with the Act - surveying, recommending improvements, advising householders and monitoring progress.

One of the key reasons for the NHER's success in social housing lies in its unique ability to provide total energy running costs. The NHER is currently the only scheme to be based on the Building Research Establishment's BREDEM-12 model and is thus capable of taking account of everything about a home that affects its energy use,

WESTBURY REACHES 10 AND GUARANTEES ENERGY BILLS

Housebuilder Westbury Homes has taken energy rating to the limit by developing an estate of homes in Milton Keynes all rated at the maximum 10 on the NHER scale. The homes, at Shenley Lodge adjacent to the original Milton Keynes Energy Park, also come with guaranteed fuel bills. NES has estimated that total bills for heating, hot water, lighting and domestic appliances for the four bedroom properties should cost no more than £300 a year, and less than £375 for the five bedroomed homes. Typical figures for conventional homes would be nearer £800 a year. If bills exceed these figures over the next three years, NES will refund the difference.

'Extra measures' built into the homes to give the 10 rating include:

- an extra 40 mm of cavity wall width, providing 100 mm of cavity insulation
- 300 mm of loft insulation, 100 mm of floor insulation
- uPVC, argon-filled double-glazed windows throughout
- twin heating circuits (ground and first floors) each with its own thermostat
- TRVs on all radiators
- gas-fired condensing boiler
- electric fans to kitchen utility room and bathroom
- low energy fluorescent lamps in the kitchen
- connection to an Economy 7 electricity tariff.

Westbury is now completing a second development in Milton Keynes, this time with two, three and four bedroom homes and again with an energy bill guarantee.

bills for homes

including lights and appliances, location and other climatic factors.

This facility is particularly important to those who need to be able to provide housing that occupants can afford to heat and light. It is most relevant for those on low or fixed incomes many of whom regularly, if not always, go cold in order to avoid debt. Therefore, for local authorities and housing associations it is vital that they have the full story on running costs if they are to make sensible decisions that take proper account of tenants' ability to pay the bills.

Housing associations have taken the use of the NHER a step further into their newbuild programmes where the NHER sits comfortably alongside the SAP for setting energy efficiency targets. Housing associations will set a SAP 75 target because this is the energy standard defined by the Housing Corporation. However, for those who wish to ensure their future tenants can afford to heat and light their homes, an NHER of 8.0 is often also set because it is the NHER total running cost figures that tell them if they are providing affordable warmth. This practice is further endorsed by the forthcoming National Housing Federation's good practice guide on Standards and Quality in Development. The guide recommends the use of BREDEM-12 software in order to better define, and provide, affordable warmth for housing association tenants.

Tackling the private sector

The social housing sector recognises the value of the NHER and accepts it as the *de facto* language for describing standards of energy efficiency. The next challenge therefore must be private housing. HECA requires local authorities to address both public and private housing and many authorities are finding innovative ways of encouraging improvements by homeowners. Several of these incorporate the NHER.

The NHER has always been involved in private housing, providing one-off assessments and advice to private householders. However, it was not until the introduction of HECA and the Private Members' Energy Efficiency Bill, that energy rating technology has had an opportunity to make real headway in this sector. One particular development route for the NHER has been in the field of fast, easy energy surveys. This technology was first developed to enable energy conservation authorities (ECA) to obtain energy information on all their stock from which to devise programmes for reducing energy use under HECA.

Prompted by the Energy Efficiency Bill, this technology was further developed through pilot studies with the Halifax and other mortgage lenders to enable valuation surveyors to collect enough energy information on which to base advice on energy improvements. The result is the NHER Surveyor II Advice System, a fast and accurate NHER survey and advice system now used by ECAs to promote energy improvements to private householders.

New developments

The NHER has always striven to be at the forefront of energy rating technology and through National Energy Services (NES), the company that develops NHER software, the scheme currently provides the housing industry with the necessary software and systems that it needs to fulfil its current energy rating obligations.

However, far from resting on its laurels, NES has developed possibly the most imaginative use for energy rating yet. Almost like coming full circle from the Milton Keynes Energy Park days, when energy rating was too complicated for consumers, NES' new scheme now neatly addresses that very issue. Called the Energy Cost Guarantee (ECG) it guarantees that the main heating and hot water bill of a home will not exceed a pre-specified level, with a cash refund if it does.

Whilst the technology is not new (the ECG level is calculated using the NHER), the presentation of the energy efficiency message is. Commended recently by the Minister for the Regions, Regeneration and Planning, Richard Caborn MP, the ECG talks about energy efficiency in a language consumers understand - £££s. The concept, also, is one they are familiar with - they understand the benefit of a guarantee and how it applies to their fuel bills.

The rating for the future

As the housing industry changes and legislation continues to focus the mind on energy issues, the NHER continues to find ways of helping the industry respond to these challenges.

Developments to the NHER will range from technical enhancements to new applications. For example the facility to deal with combined heat and power (CHP) is a recent inclusion. Anyone considering installing CHP will be know how complicated it can be, with a myriad of systems and charging methods to consider. NES has been working with the BRE on this and there is now an approved methodology included in the most recent SAP update. Currently, NES and the BRE are working on a more advanced implementation of CHP for inclusion in the NHER.

Other technological advances include multi-residential buildings where NHER software can analyse energy use in buildings serviced by a central plant.

With regard to new applications, some local authorities are linking NHERs to rents. Those properties with high ratings pay more rent. This additional income is then reinvested by the authority to fund further energy improvements to the stock. Looking further into the future, energy rating might assist in ensuring that cold weather payments are distributed more fairly and promptly. And with the recent suggestion for housing log books, an energy rating could be part of a home's MOT.

Contact NES, tel: 01908 672787, fax: 01908 62296

Controlling carbon from power long-term storage

By Dr Pierce Riemer, IEA Greenhouse R&D Programme

There is no shortage of published information about technology and strategies to reduce the emission of carbon dioxide as a means of averting climate change. Less well-known are methods being developed to capture and store CO_2 once it has been produced. The International Energy Agency is leading the way with its Greenhouse R&D Programme.

The prospect of changes in the world's climate is, rightly, causing a great deal of concern today.

The main contribution to climate change from human activities arises from build-up in the atmosphere of so-called greenhouse gases, principally carbon dioxide but also methane and others see Figure 1. Apart from the natural carbon cycle, emissions of carbon dioxide arise mainly from combustion of fossil fuels (about 6 gigatonnes of carbon per year - GtC/y) and deforestation (about 2 GtC/y). On a global basis, power generation accounts for over 30% of carbon dioxide emissions from fossil fuels, making it the single largest such source. Other large sources are transport and heating.

Emissions from power generation occur as relatively few, large gas streams; in contrast, transport and heating emitters are many, relatively small and dispersed. This suggests that technical changes to reduce emissions may be applied more easily in the power generation sector than elsewhere.

At the Kyoto conference, the developed countries agreed to an average reduction of 5.2% in greenhouse gas emissions by the period 2008-2012. Deeper reductions in emissions may be needed in future if some of the projections of future climate change are proved to be correct.

Technical options

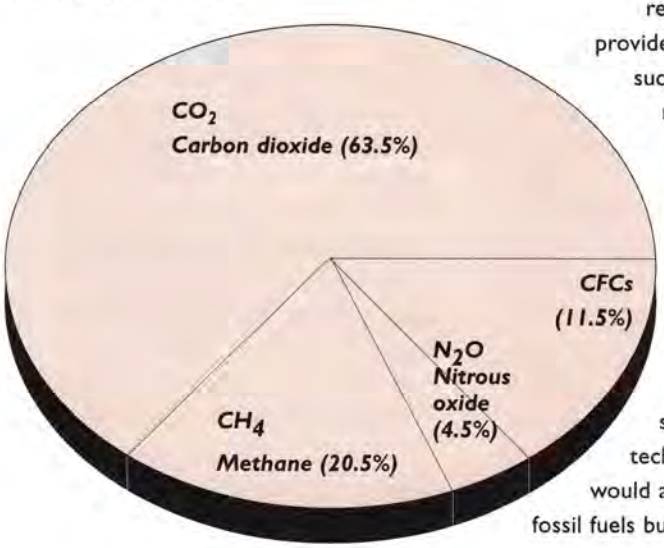
Reducing emissions of carbon dioxide could be achieved by reducing the demand for energy, by altering the way that energy is used, or by changing the method of producing/delivering energy. Demand for energy can be influenced by fiscal measures and changes in behaviour but, in the technical area, there are three distinct types of option for reducing emissions:

- improving energy efficiency,
- switching to low carbon fuels,
- switching to no-carbon fuels.

The first two options are cost-effective in many places today and will deliver useful reductions but whether this will be sufficient is not yet known. Deeper reductions could be provided by the third option, such as switching to renewable energy or nuclear power. However, the fact remains that the world is heavily dependent on fossil fuels. For this reason, it is important that there should also be technology options which would allow continued use of fossil fuels but without substantial emissions of CO_2. This could be done using the technology of capture of CO_2 from flue gases with subsequent storage, which is described below.

In order to learn more about such technologies for reducing emissions from use of fossil fuels, a number of countries are collaborating through the IEA Greenhouse Gas R&D Programme. This Programme is supported by 16 member countries, as well as the European Commission, and six industrial sponsors. In many countries, the electricity industry and other companies in the energy sector contribute to the national membership. The Greenhouse Gas Programme delivers new information to its members at low cost, as well as providing opportunities for practical research. Much of its work has been directed at carbon dioxide from its main source, power generation, but work has also been done on other greenhouse gases, especially methane, and other sources.

Figure 1 Contributions to climate change from anthropogenic sources



Capture and storage

The main steps in the process of capture and storage of CO_2 are shown in Figure 2. After the fossil fuel has been burnt to produce power, the CO_2 is separated from the flue gas stream. Then the CO_2 would be stored, for a long time, if it cannot be put to some useful purpose.

The technology of capture is already in use today to supply CO_2 to the food industry. It makes use of the technique of solvent absorption or of adsorption onto a solid surface (ie pressure swing adsorption). Systems could also be developed based on membranes or cryogenics, which would be particularly suitable for flue gas streams with high concentrations of CO_2. Studies of these separation processes have been conducted for the common types of power plant: natural gas combined-cycle and pulverised coal plant, as well as possible future plant including oxygen-blown and air-blown gasification

generation by capture and

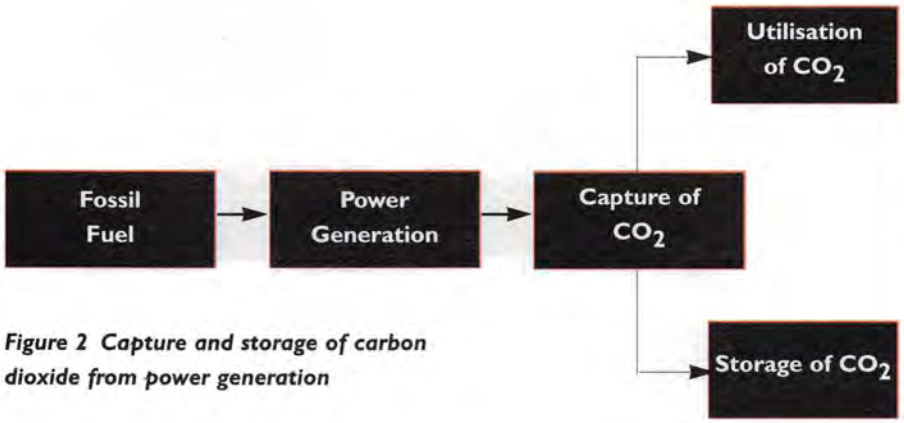


Figure 2 Capture and storage of carbon dioxide from power generation

	Global capacity Gt C
Disused oil fields	>40
Disused gas fields	>140
Deep saline reservoirs	>100
Ocean	>1000

Table 3 Options for storage of CO_2 in natural reservoirs

combined cycles and fuel cells.

Standardised assessment conditions are used to ensure comparability between the various studies - for example, each plant is rated at 500 MWe (sent out); CO_2, once captured, is assumed to be dried and pressurised for transport to the storage site; fuel costs are $3/GJ for gas and $2/GJ for coal, plus a range of sensitivities; levelised costs are calculated at 10% discount rate; results are presented in terms of the amount of emissions avoided by comparison with a similar type of plant but without capture; results are expressed in terms of tonnes of carbon-avoided (1 tC is equivalent to 3.6 t CO_2).

Natural gas-fired plant

The base-case plant is a combined cycle (NGCC). Cost of power from the base-case plant is 3.5 US ¢/kWh, with emissions of 406 gCO_2/kWh. Capture of CO_2 is by solvent absorption (using monoethanolamine, MEA) with a scrubber in the flue gas stream. The CO_2 concentration in the flue gas is low (3.4%) making removal of CO_2 quite expensive. The NGCC plant with CO_2 capture is illustrated in Figure 3; some data on cost and performance are shown in Table 1.

Table 1 Performance of natural gas combined cycle plant with CO_2 capture

	Efficiency %	Emissions gCO_2 /kWh	Power cost US ¢/kWh	Cost of avoided emissions ($/tC)
NGCC with MEA solvent absorption	42.0%	76	5.3	198

Coal-fired plant

Various options have been examined for coal-burning plant. Two base-cases were considered: the conventional pulverised fuel coal plant (PF) and an integrated gasification combined cycle (IGCC) plant. Emissions from the base-case plant are about 800 gCO_2/kWh, with power costs around 5 US ¢/kWh.

These plant were also assessed with CO_2 capture (using MEA or Selexol solvent absorption) as shown in Table 2. A variant of the IGCC incorporating a shift reaction stage, to convert CO to CO_2 and hydrogen, would make easier the subsequent capture of CO_2. This and air-blown gasification have also been considered.

Table 2 Performance of various types of coal-fired plant incorporating CO_2 removal

	Efficiency %	Emissions gCO_2/kWh	Power cost US ¢/kWh	Cost of avoided emissions ($/tC)
PF (MEA capture)	28.8	116	7.4	126
IGCC (MEA capture)	28.2	114	11.2	313
IGCC with shift (CO_2 capture using Selexol)	35.5	170	6.3	58
ABGCC (MEA capture)	25.3	402	9.3	403

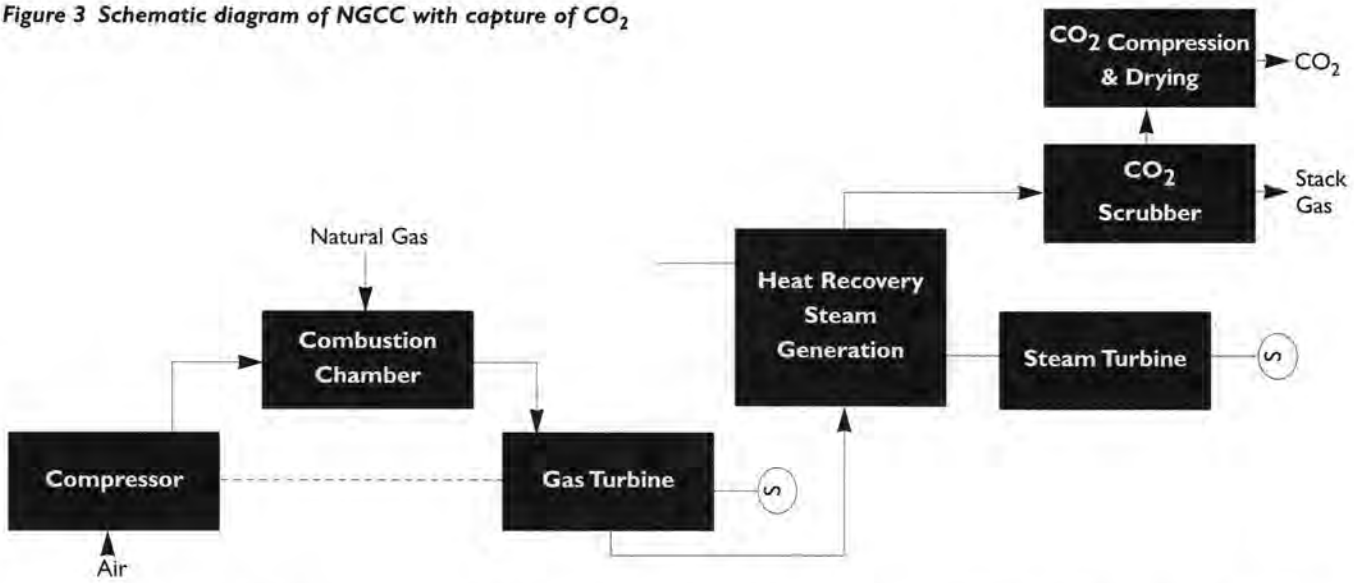
Although the IGCC type of plant is only now at commercial demonstration stage, this would appear to offer advantages over other coal-fired plant in terms of minimising the cost of removing CO_2, providing this is done by incorporation of the shift reaction stage to optimise the conditions for CO_2 removal.

Utilisation and storage

Having captured the CO_2, it would have to be put to use or stored somewhere, separate from the atmosphere. One option for utilisation of CO_2 is enhanced oil recovery (EOR); this is done now with naturally occurring CO_2. Captured CO_2 is somewhat more expensive than natural CO_2 but applications for it in EOR are now being developed. Other methods of utilising captured CO_2 have been examined but none have been found to offer substantial net savings in emissions.

To store the CO_2 would require very large reservoirs - for example, disused oil or gas fields, deep saline-water reservoirs or the deep ocean (see Table 3). Disused oil and gas fields have the attraction that the geology has

Figure 3 Schematic diagram of NGCC with capture of CO_2



been well studied and, in principle, a geological seal is known to exist, which will ensure long term storage. However, as yet, no storage has been undertaken in such fields. Instead, the first commercial-scale storage of CO_2 uses a deep saline-water reservoir under the North Sea. This project - see cover picture - began operation in 1996. It is storing 1 million tonnes of CO_2/year extracted from the natural gas stream produced from the Sleipner West gas field. The field's operator, Statoil, have installed an MEA plant to separate CO_2 from the produced gas stream. It is then pressurised and injected into the Utsira formation, 800 m below the sea-bed.

Another option considered for storage of CO_2 is the deep ocean. Eventually most atmospheric CO_2 will be deposited in the deep ocean, so this could be thought of as an acceleration of the natural process. There are many ideas for this type of scheme but there are substantial obstacles too. In the longer term, this storage option might be needed but, in the meantime, much research is required to clarify likely performance and environmental impact, not to mention the legal basis for such actions.

Estimates of the global storage capacity of these options are shown in Table 3, which indicates there would be many years of capacity available. In all of the cases shown, the cost of transporting the CO_2 and storing it should be only a few $/tC, substantially less than the cost of capturing it.

Natural sinks for CO_2

An alternative to end-of-pipe removal of CO_2 is to remove it from the atmosphere by enhancing the take-up by natural sinks - typically in growth of trees but options for enhancing take-up by the oceans are now also being discussed. Such methods have received much interest in recent years and the agreement reached in Kyoto in 1997 specifically allows countries to take advantage of enhancement of natural sinks on land to offset emissions of greenhouse gases. The terrestrial options are:

- reduction in deforestation,
- afforestation of land which has not supported forests previously,
- reforestation of land which has been under forestry at sometime in the (recent) past.

It has been estimated that afforestation and reforestation could sequester as much as 0.8 GtC/y world-wide; the main limitation on this being the amount of land required - 210 million ha. Increases in carbon stored in the soil could usefully contribute as well. For the first such schemes, covering areas of typically 10 000 ha, the costs are thought to be very low ($3-14/tC sequestered) in developing countries. In developed countries and at larger scale of operation, the costs of sequestration rise, not least because of the pressure on available land. Thus for large-scale schemes in tropical countries, costs of sequestration are estimated to be in excess of $25/tC; comparable schemes in a mid-latitude developed country would be over $70/tC.

Having started to sequester carbon in trees, the forest must be maintained for long periods of time in order to ensure the carbon is not re-released to the atmosphere. Thus when the trees mature (and the rate of take-up of carbon slows down), they serve less as a sink than a store (providing they are suitably managed). Otherwise, the timber may be harvested and the area replanted in a regular fashion, which maintains a dynamic store of carbon.

The future

Capture and storage of CO_2 would provide a means of substantially reducing emissions from use of fossil fuels for power generation. The cost would be comparable with that of other means of reducing CO_2 emissions, such as substitution of renewable fuel from biomass or large-scale enhancement of carbon sinks. Each of these options has different characteristics. This range of choice will allow fossil fuel users to find a method of reducing emissions which is best suited to their circumstances.

International agreement has now been reached on reducing emissions by 5%; the need for deeper reductions will become clearer as better understanding is achieved about climate change. In the meantime there is opportunity for research on new concepts for capture and storage of CO_2, further development of the technique and demonstration of practical operation. This will ensure the technology is available when it is needed. The IEA Greenhouse Gas R&D Programme is promoting international collaborations in all of these areas.

Contact Dr Riemer at the IEA Greenhouse Gas R&D Programme, tel: 01242 680753, fax: 01242 680758, email: pierce@ieagreen.demon.co.uk

June 1998

CHP - financing for managers
DETR seminar,
10 June, Cardiff, free
Details from Janet Hutchings, ETSU, tel: 01235 433942, fax: 01235 433737

Gas 2000
SBGI symposium, 10-11 June, London, £495 + VAT
Details from the Society of British Gas Industries, tel: 01926 334357, fax: 01926 450459

Partnership opportunities in energy efficiency
Conference and exhibition, 11 June, Blackpool
Details from the Council for Energy Efficiency Development, tel: 01428 654011, fax: 01428 651401, email: theceed@compuserve.com

Nordic electricity trading
Conference, 11 June, Stockholm
Details from ICM Ltd, tel: 0171 436 5735, fax: 0171 436 5741

The benefits and risks of energy liberalisation
WEC forum, 11-12 June, Bath, £750
Details from the British Energy Association, tel: 0171 930 1211, fax: 0171 925 0452

Renewable energy strategies
Course, 11-12 June, London, £295
Details from the Centre for Continuing Professional Education at the South Bank University, tel: 0171 815 7675, fax: 0171 928 8968, e-mail: normanld@vax.sbu.ac.uk

Southern Africa electricity summit
Conference, 15-17 June, Harare, Zimbabwe, £699
Details from IBC UK Conferences, tel: 0171 453 5491, fax: 0171 636 6858, e-mail: cust.serv@ibcuk.co.uk

Electrex 98
Exhibition, 15-18 June, Birmingham
tel: 01483 22288, fax: 01483 224321

Energy, efficiency and equity
Melchett lecture by Dr Brenda Boardman, 16 June, Free, London
Details from The Institute of Energy, tel: 0171 580 7124, fax: 0171 580 4420, email: madams@ioe.org.uk

EESAT 98
Conference on electrical energy storage, 16-18 June, Chester, £850 + VAT
Details from EA Technology Ltd, tel: 0151 347 2557, fax: 0151 347 2256, e-mail: db@eatl.co.uk

Introduction to oil industry operations
Course, 17-19 June, London, £1100 + VAT
Details from the Institute of Petroleum, tel: 0171 467 7100, fax: 0171 255 1472

UK electricity outlook
Workshop, 22-24 June, Brighton, £1395 + VAT
Details from Power Ink, tel: 01730 265095, fax: 01730 260044

Petroleum economics
IoP course, 22-24 June, London, £1100 + VAT
Details from the Institute of Petroleum, tel: 0171 467 7100, fax: 0171 255 1472

Energy law symposium
Conference, 24-25 June, London, £899 + VAT
Details from Euroforum, tel: 0171 878 6886, fax: 0171 878 6885

Gas in central and eastern Europe
Conference, 24-25 June, Budapest, £945
Details from Business Seminars International, tel: 0171 490 3774, fax: 0171 505 0090, e-mail: 100451.3120@compuserve.com

Combustion control into the 21st century
Conference, 25 June, Manchester
Details from the Combustion Engineering Association, tel: 01685 879119, fax: 01685 874400

European oil refining
Conference and exhibition, 25-26 June, Prague
Details from WEFA Ltd, tel: 0171 631 0757, fax: 0171 631 0754

North African oil
Conference, 29-30 June, London, £899 + VAT
Details from SMi Conferences, tel: 0171 252 2222, fax: 0171 252 2272, e-mail: 100531.3607@compuserve.com

Year 2000 utilities
Conference, 29-30 June, London, £899 + VAT
Details from SMi Conferences, tel: 0171 252 2222, fax: 0171 252 2272, e-mail: 100531.3607@compuserve.com

Wind power technology
BWEA course, 29 July - 3 July, Loughborough
Details from Loughborough University, tel: 01509 223466, fax: 01509 610031, e-mail: h.a.thompson@lboro.ac.uk

Environmental performance reporting
Course, 29 July - 3 July, Guildford
Details from University of Surrey, tel: 01483 259047, fax: 01483 259394, e-mail: p.savill@surrey.ac.uk

Engine emissions measurement
Course, 29 June - 3 July, Leeds
Department of Fuel & Energy, University of Leeds, tel: 0113 233 2494, fax: 0113 233 2511

Radioactive waste management and decommissioning
Summer school, 29 June - 3 July, Cambridge
Details from IBC UK Conferences, tel: 0171 453 5491, fax: 0171 636 6858, email: cust.serv@ibcuk.co.uk

July 1998

Eco-management auditing
Conference, 2-3 July, Sheffield, £245 + VAT
Details from ERP Environment, tel: 01274 530408, fax: 01274 530409

Ellis Memorial Report

(left to right) Andrea Cook NEA, Neil Peacock PowerLine, Mark Baker President Elect, Stephen Littlechild, Offer

The Midland's Branch committee, and especially Harry Freeman, the Honorary Secretary are to be congratulated on the success of the Ellis Memorial Lecture this year.

On 30 April at Aston Villa Football Ground, Andrea Cook OBE JP, Director of NEA, gave a thought-provoking presentation on Fuel Poverty. Ms Cook explained how fuel poverty and its associated problems affect some 8 million households in the UK - a startling figure which even got the electricity Regulator, Stephen Littlechild, doing his sums and discussing with Ms Cook, and the 100 strong audience, how the £20 billion needed to eliminate fuel poverty could be raised.

At the end of the Lecture, Harry Freeman invited Louise Evans from the Institute's offices in London, to suggest how the Institute might contribute to the efforts of organisations working in this important area. Louise explained that the Institute was learning with interest about the problems of fuel poverty and wanted to help organisations to come together on the subject. The Institute offers an excellent platform to bring organisations together. For example, industry must have the potential to contribute to the elimination of fuel poverty. The Institute would like to work with NEA and others to stimulate partnerships to solve some of the problems highlighted by Ms Cook in her presentation.

The next activity associtated with the topic of fuel poverty is the Institute's Melchett Lecture in London on 16 June 1998 at the Royal Geographical Society, where Dr Brenda Boardman will give her lecture on "Energy, efficiency & equity".

It is hoped that both presentations will be published in a future edition of *Energy World*, so watch this space!

For further details contact Maria Adams at the Institute, tel: 0171 580 0008

Branch Events

June 1998

SCOTLAND
Tuesday, 2 June, 6.30pm for reception, Scottish Engineering Centre, Glasgow.
"Energy policy in a devolved Scotland". Speakers from Scottish Hydro Electric and the Scottish Office. *Contact Maria Adams on tel: 0171 580 7124 to reserve your place*

NORTHERN IRELAND
18 June, 6.30pm
Belfast City Hall. Energy awards for young apprentices and energy managers.
Contact Louise Collins if you would like to attend on tel: 0171 580 0008, fax: 0171 580 4420, email: lcollins@ioe.org.uk

SOUTH WALES AND WEST OF ENGLAND
Thursday, 18 June, 10am
Works visit and lecture "low NOx burners and the Future of Combustion", joint meeting with The Combustion Engineering Association.
Contact Mr I Weslake Hill, tel: 01222 757527

NORTH EASTERN
Friday, 26 June, 6.30pm
Summer Event - Visit to Earth Balance at West Sleekburn Farm, Bormarsmund.
Contact Mr C R Howarth, tel: 0191 222 7303

September 1998

Tuesday, 22 September, CBI, "Energy: Solving the policy jigsaw"
Contact Louise Evans on 0171 580 0008 for more details.

Benevolent Fund of The Institute of Energy

Many of our members may not be aware that we manage a separate Benevolent Fund within the overall financial management of the Institute.The fund provides emergency or educational support to neccessitous members of any grade and their dependants.

The management Committee of the Benevolent Fund wish for members to be made more aware of the existence of the Fund. If you know of anyone who may be eligible to benefit from the Fund, please contact, in complete confidence, your local Branch Chairman or the Secretary and Chief Executive at The Institute of Energy, 18 Devonshire Street, London, W1N 2AU.

Shell Research Fellowship

You will recall that in the April edition of *Energy World* the Institute asked you to apply in time for the September Renewable Energy conference, however this has now been moved to the 22-28 November 1998, in Brighton.

Therefore please state whether you would be able to attend on this date on your application. Please apply in writing by 31st July 1998 to the Shell Research Fellowship" at The Institute of Energy.

New Members

LONDON & HOME COUNTIES

Mr G Abedi
Student

Mr W Agar
Student

Mr D Karim
Student

Mrs Andrea Latter
Associate
Enfield Borough Council

Mr D Iorga
M Inst E
Cambridge Consulting Engineers

Mr K Berketis
Student

Mr D Davies
Associate
Entech Energy Consultants

Mr R Donovan
Graduate
Renewable PWR Systems Ltd

Mr F Pierrel
Student

YORKSHIRE

Miss C Bramley
Student

Mr N Brown
Student

Mr C Sodipo
Student

Miss A Chung
Student

Mr S Clarke
Student

Mr Kevin Connolly
M Inst E
Korea Transit Systems Ltd

Mr E Theos
Student

Mr R Backreedy
Graduate
University of Leeds

Mr S Thompson
Student

Mr D Walter
Student

Ms S Williams
Student

The young ones!

The Institute wants to ensure the active participation of young members in the organisation throughout their careers, seeing the Institute grow with their enthusiam for the field. The Membership and Education Manager, Tracey Fisher has been asking young members about their views on the Institute and the benefits they want to get from being a member.

(left to right) James Patterson Member CEng, Energy Engineering Consultant, Linden Consulting Partnership, Mark Howell, Graduate Member, Project Engineer, Tracey Fisher, Membership and Education Manager, Tony Willox, Associate Member IEng, Energy Manager Royal Mail, Bryan Shaughnessy, Graduate Member, Research Officer in Thermal-Energy Processes, Cranfield University.

Young members' brainstorms have taken place in various locations around the country and the membership and education team are now compiling a portfolio of responses to action in the future. A few to watch out for are:

- a young members' group
- a mentoring system to help them progress in the field.

Joanne Spencer, Graduate Member, sponsored by National Power to complete a PhD on environmental and economic aspects of NOx reduction techniques on a low-volatile coal fired downshot boiler, Tracey Fisher, Membership and Education Manager, Andrew Richards, Graduate Member currently undertaking a course of research for a PhD relating to particle flow and re-entrainment in cyclone separators. Both are at the University of Glamorgan.

SOUTH

Espicom
Group Affiliate

MIDLAND

Ceram Research
Group Affiliate

SOUTH WALES AND WEST OF ENGLAND

Mr R Price
M Inst E
University of Glamorgan

NORTH EAST

Mr J McCombe
Student

Ms E Wright
M Inst E
Merz and Mclellan Ltd

NORTH WEST

Mr Malcolm Peplow
AM Inst E
Manchester Housing

the institute of energy

Melchett Medal 98

This prestigious award is made to Dr Brenda Boardman for her authoritative work on fuel poverty

The Melchett Lecture

Tuesday, 16 June 1998, 6.15pm

Royal Geographical Society, London

"Energy, efficiency and equity"

by Dr Brenda Boardman

PowerGen Fellow in Energy Efficiency at St Hilda's College and Head of Energy & Environment programme, Environmental Change Unit, University of Oxford

Admission is free

I/we ( ) will be attending the Melchett Lecture on 16 June 1998

Name(s)

Job Title(s)

Organisation(s)

Address

Tel: Fax: Email:

Please state if you have any special dietary requirements.

Return to: Maria Adams
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18 Devonshire Street
London, W1N 2AU
Tel: 0171 580 7124,
Fax: 0171 580 4420,
email: madams@ioe.org.uk

Energy and Environment Programme
Environmental Change Unit
University of Oxford

St Hilda's College