THE MAGAZINE OF THE INSTITUTE OF ENERGY

energy world

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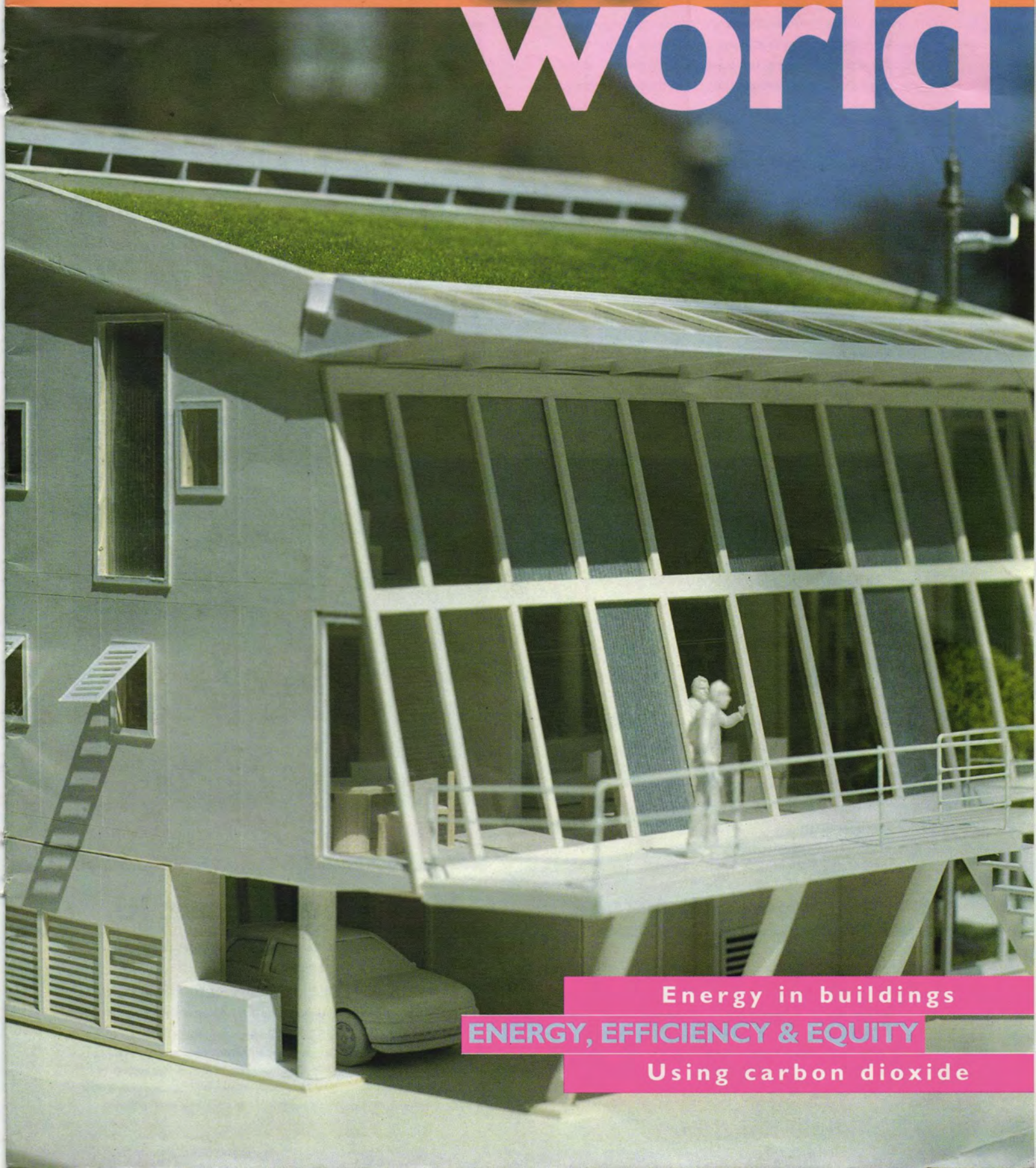


Energy in buildings

ENERGY, EFFICIENCY & EQUITY

Using carbon dioxide

Awards

For members' information, the 1997 Institute Award winners are listed below, as first published in the 1997 Annual Report in June 1998.

Melchett Medal

Dr B Boardman MBE

The award is made without restriction as to nationality or to membership of The Institute of Energy for outstanding work, whether in research, administration, construction or other professional activity, involving the scientific preparation or use of fuel, the results of which have recently been made available to the community.

Recognition of Services

To: H F Ferguson
Dr A Mallalieu
Dr M R Palmer
M B Pittwood

Award for special services to The Institute of Energy.

R H Gummer Exhibition

To: Y Prasetyo
(forty-second award)

The award is made annually to a student nominated by Imperial College of Science and Technology for work at undergraduate or postgraduate level, in energy technology.

Lubbock-Sambrook Award

To: C Philipped and J Werther for their paper "Co-combustion of wet sewage sludge in coal-fired circulating fluid-bed combustor" (J Inst E December 1997).

The award is made for the best paper on liquid fuels from whatsoever source, published by The Institute of Energy in the year under review.

Townend-BCURA

(Thirteenth award)

To: YB Yang, TA Naja, B M Gibbs and E Hampartsoumian for their paper "Optimisation of operating parameterws for NO reduction by coal reburning in 0.2 MWt furnace" (J Inst E March 1997).

The award is made for the best paper on the subject of production, distribution and utilisation of coal, published by The Institute of Energy in the year under review.

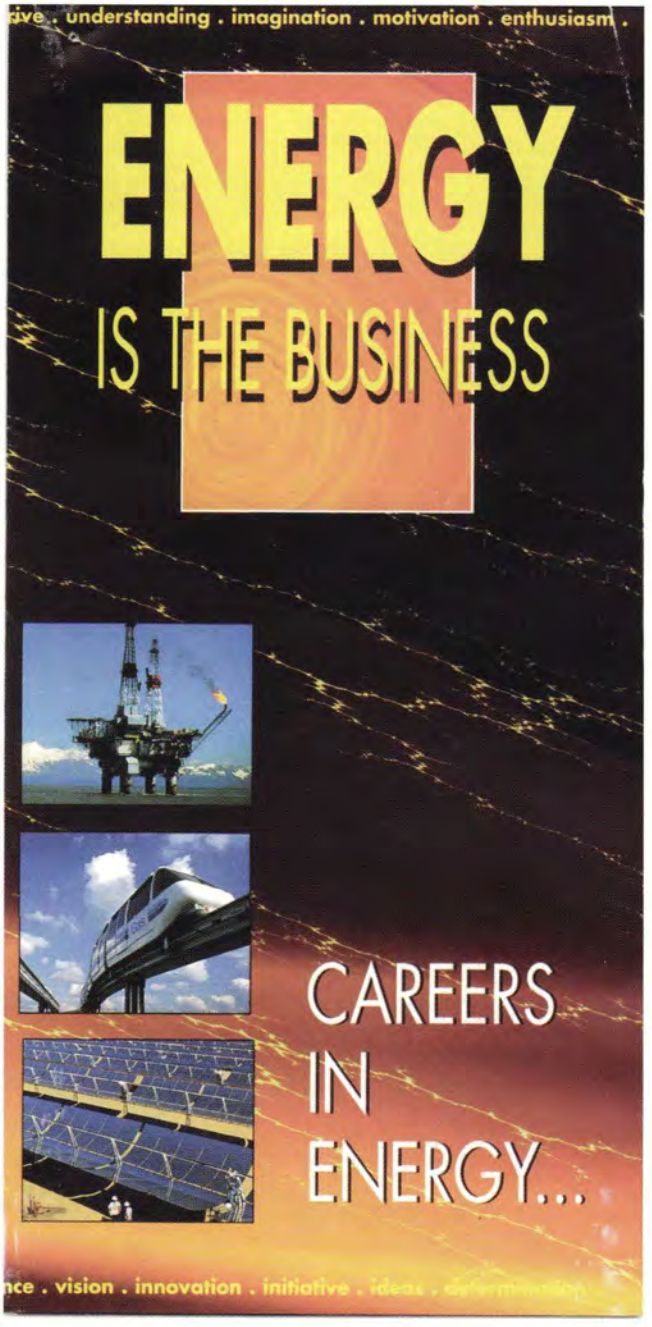
ITS Intertek Testing Services (UK) Ltd Caleb Brett Award of the Institute of Energy

To: N Ladommatos, P Rubenstein, K Harrison, Z Xiao and H Zhao for their paper "The effect of aromatic hydrocarbons on soot formation in laminar-diffusion flames and in a diesel engine" (J Inst E September 1997)

The prize is awarded to the best paper on commercially utilised liquid fuels or lubricants, published by The Institute of Energy in the year under review.

STOP PRESS

The Institute of Energy has just published an energy careers information leaflet for young people, entitled "Energy is the Business - Careers in Energy". Featuring some of the Institute's members and information on their professions, it also illustrates the routes to membership of the Institute. ***If you would like to receive a copy of this leaflet shown below, email Beatriz Cano on "membership@ioe.org.uk" or tel: 0171 580 0077***



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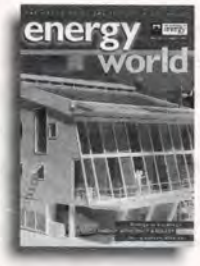

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COVER

A model of Made by Man's 'concept house' which won second prize at last year's Ideal Home exhibition for house designs which would cost less than £100,000 to build. Among many generic designs for low energy and environmentally benign homes *(see also page 16)*, this one marries low energy content building materials (using standard 8 x 4 building sheets) with low energy use (using passive solar design, low energy heating systems, PV panels and a wind turbine).

The house is organised mainly on the first and second floors - the ground floor enclosure houses batteries, a gas boiler, and recycling stores (including water). Minimal use of the ground floor also reduces excavation for foundations and disruption to topsoil. On the first and second floors, service areas - bathroom, utility and circulation are located on the north face with living areas to the west, south and east.

The concept house would cost £67,000 to build, compared to £82,000 for a traditional five person dwelling, say the London-based Made by Man, although the wind turbine, PV panels and batteries would add a further £30,000 to that.

Liberalising gas markets in the EU

The EU Directive on liberalisation of the gas markets was finally approved in December 1997 and it is to be translated into national law and implemented in each member country by the beginning of the year 2000. Until this date, there is no obligation for countries to disclose how such implementation will take place. In short, there are no immediate changes as a result of this directive. Gas markets in Europe have been slow to follow the pattern of the UK where the market is now open for competition and there are many licensed suppliers.

Sue Simms, Managing Director - Alliance Gas Ltd

The EU Directive requires member countries to begin to open up their markets to competition starting with the larger consumers and gradually moving to the situation in the UK where all sites may seek competitive supplies. The programme extends in three phases to 2010; each country has been set targets based on a customers size distribution proposed by the EU. Market opening in Spain and the Netherlands is due to move ahead of the directive and under the new German Energy law, any customer can choose a new supplier, however in practice, this may not be so easy.

Whom will this affect?

The opening of the market will allow all premises that consume above 9.5 million therms of gas per annum (mthpa) the option to choose their gas supplier. The minimum (compulsory) level is set at 20% of the volumes in the total gas market of each member state, and the maximum (optional) is set at 30%. This means that if allowing all premises over 9.5 mthpa the freedom to choose a supplier leads to a level of market opening above 30%, the member state concerned is allowed to increase the eligible threshold in order to limit liberalisation to 30%. If however, the 9.5 mthpa threshold does not lead to a minimum liberalisation of 20% of the total market, then the volume threshold will need to be lowered to enable this minimum competition threshold to be met.

Because gas usage in each member state differs, a 20% liberalisation target in, for example, France will mean all consumers over 9.5 million therms can choose a new supplier, whereas in Belgium a 30% liberalisation target will still only allow premises using over 29 mthpa the right to choose.

In comparison to the deregulation process experienced in the UK, the proposed timetable for liberalisation in continental Europe appears to be very slow. In line with the Directive, ten years after implementation, the minimum threshold will still be 2 mthpa.

Transportation

Access to a transporter's pipeline network or third party access (TPA) will vary in each individual member state. Countries are able to choose between 'negotiated' and 'mandatory' TPA. To date there is no indication that any EU country will opt for regulated tariffs in the same way as the UK. Even Holland, who appears to have an open mind to liberalisation, is opting for a complex system of negotiated TPA.

To access the transportation tariffs applicable to European sites, an approach needs to be made to the relevant gas company. However at this moment, it appears that only the Dutch company, Gasunie, has decided on the tariff components and structure for TPA to its system.

Problems with the Directive

The directive itself will not be decisive in determining the development of competition in Europe. From our experience in the UK, we saw competition develop in an environment where the existing monopoly supplier (BG) was

- forced to reduce its market share,
- obliged to publish its end-customer tariffs and restricted from changing them,
- obliged to publish its transportation tariffs, and
- a strong regulator was in place.

These conditions, whilst seen as pivotal in the development of competition in the UK, are not imposed by the EU directive on its member states.

At this stage, it is not possible to give an indication of the savings on offer, as transportation and storage costs for each country have not been defined.

We anticipate, however, that there will be significant savings as a result of competition as pressure is put on the marketing margin of the existing gas companies. The scope for price reductions is unlikely to be as extensive as those seen in the UK as European beach prices are currently in the order of 15-16 pence per therm whereas, when competition took off in the UK, beach prices were in the order of 21-22 pence per therm.

The way forward

Whilst on the surface the EU directive appears fairly weak, it is important to remember that it is only one force among many that will influence the pace and way in which competitive markets develop in continental Europe. The scheduled opening of the Interconnector pipeline next month will physically link the UK and continental European gas markets, and this will be an important influence on the development of European spot markets.

The rate of movement towards liberalisation and the resultant market conditions in individual member states will be influenced by both those advocating competition within each country and also by large end-customers collectively lobbying for change.

OSPAR ends steel platform dumping and cuts limits on nuclear reprocessing emissions

Historic new international agreements to reduce radioactive emissions from nuclear installations to 'near zero' and to ban the dumping at sea or toppling of large offshore steel installations are predicted to have far reaching consequences for European energy industries. The agreements were reached at the first ministerial meeting of the Oslo and Paris (OSPAR) Commission in Sintra, Portugal in July.

The Commission was set up under the 1992 OSPAR Convention for the Protection of the Marine Environment of the North East Atlantic, which came into force earlier this year.

Environmentalists immediately hailed a victory in their campaign to ban the dumping of redundant offshore structures and vindication of their stance on reducing radioactive discharges to the sea. The agreement "signals the beginning of the end of the nuclear reprocessing industry" according to Greenpeace.

The agreement will mean the scores of steel platforms (except for the footings of the very largest) will now have to be removed from the North Sea and disposed of offshore, rather than considered for removal on a case- by-case basis. Large concrete structures will be allowed to remain in place.

Just as important, said UK Deputy Prime Minister John Prescott, "is the agreement on reducing the levels of radioactive discharges to the sea from Sellafield which means the plant can continue to operate, but must reduce radioactive emissions to near zero, taking account of technical feasibility."

British Nuclear Fuels Ltd said that the agreement presented the company with "demanding challenges over the next 20 years" but stressed that technical feasibility is to be taken into account when setting new discharge limits, and that zero discharges are not technically feasible from Sellafield. The company denied reports that the agreement means that Magnox nuclear power stations would be forced to close early.

'Auto-Oil' directives to cut European emissions

Tighter emission standards for cars and light vans and new better quality motor fuels will greatly improve Europe's air quality, according to the UK Environment Minister Michael Meacher, speaking in Brussels after agreement on the directives was reached between the Council of Environment Ministers and the European Parliament.

The agreement concludes two years of tough negotiations between Member States and the European Parliament and follows on from the joint industry/Commission Auto-Oil study.

From January 2000, the two directives will:

- cut emissions from petrol-engined cars and light vans by 30-40%,
- cut emissions from diesel-engined cars by up to 50%,
- slash the sulphur content of petrol by 70% and diesel by 30%, and
- slash the benzene content of petrol by 80%.

In addition, from January 2005, emissions standards will be cut by a further 50%, said Meacher, adding that the proposed schedule for adopting the directives: "sets out a clear strategy for vehicle manufacturers and oil refiners, and gives them time to make the investment necessary to meet the demanding targets set for 2000, and again in 2005."

The directives also introduce several other changes to emissions test procedures and durability requirements aimed at better reflecting normal vehicle use.

German coal producers to repay state aid

The European Commission's decision to make German anthracite producers Sophia Jacoba and Preussag Anthrazit repay DM 20 million of state aid, unfairly used to support heavily subsidised sales of anthracite into the UK, has been welcomed by UK Energy Minister John Battle.

He also welcomed the tough conditions which the Commission imposed when giving initial approval to the acquisition by Ruhrkohle of Preussag Anthrazit and another German coal producer, Saarbergwerke, to form a single German coal-mining company.

New solar manufacturing plant in Sydney

BP Solar Australia is to build what will be one of the world's largest solar manufacturing facilities in the Sydney suburb of Belrose. The A$57 million plant will manufacture 20 MW a year of the latest generation of high performance solar cells, with potential to expand to 50 MW a year. World solar output was 100 MW in 1997, says BP.

BP Solar developed and commercialised the buried grid laser technology photovoltaic cells, known as Saturn, over 10 years, utilising technology pioneered the University of New South Wales. The new plant, due to come on line in October 1999, will make Australia the third largest supplier of photovoltaics, after the US and Japan.

UK's largest gas terminal gets bigger

SAGE - the UK's largest gas terminal

The Scottish Area Gas Evacuation (SAGE) system is now capable of processing over 23% of the UK current average daily gas demand following the summer's introduction of gas from the Britannia field in the Northern North Sea, according to SAGE operator Mobil North Sea Limited.

The increase follows the completion of a £50 million investment programme to increase the capacity of the SAGE Terminal at St Fergus. The work, which started in the autumn of 1996 and was completed on schedule and under budget, increases SAGE's gas processing capacity from its previous level of 1150 million standard cubic feet per day (mmscfd) to 1890 mmscfd. This reinforces SAGE's position as the UK's largest gas terminal.

The new Britannia processing facilities at the SAGE Terminal will process dense phase gas from the Britannia field. The new facilities will deliver up to 740 mmscfd of specification sales gas to the adjacent GB Transco facility for onward transportation to consumers.

Year 2000 moves at Shell

Expert staff from AEA Technology are working with Shell UK Exploration and Production, operator on behalf of Shell, Esso and other co-venturers in all sectors of the North Sea, to ensure that around 4,000 systems continue working when the Year 2000 date changes. A wide variety of asset integrity, business computing and IT telecommunication infrastructure systems, both onshore and offshore, are being investigated.

AEA Technology says that its staff are working closely with Shell Expro teams to identify problems and provide remedial solutions to ensure that business continuity and safety will be ensured over the date-change period and into the new millennium.

The Year 2000 Project aims to correct systems classified as high or medium criticality by the end of this year. But AEA Technology is helping Shell Expro make business contingency plans for dealing with problems which might arise if any systems fail during the run-up, and into, the new millennium.

The Year 2000 problem has arisen because many systems were designed to store information using only two digits to denote the year. Many applications will assume that '00' denotes the year 1900 and will seize up.

Electricity market opens

The first areas of the electricity market opened to full competition in supply on 14 September when around 10% of the domestic and small business customers, identified by their postcode, together with all customers with half-hourly meters and maximum demand meters across these regions, had access to competition. More than 750,000 customers are now able to choose their electricity supplier in selected parts of the areas of Eastern Electricity, Manweb, ScottishPower and Yorkshire Electricity.

Each of these companies and British Gas Trading have been able to supply customers.

First renewables projects enter the open market

Over 40 members of the Renewable Generators' Consortium (RGC) have signed contracts to supply collectively 120 MW of electricity in the open market after 1st January 1999. This represents about one fifth of the capacity up and running so far as a result of the Government's Non-Fossil Fuel Obligation (NFFO) policy.

The move also marks the generators' move out of the protected market from which they have previously benefited under the first and second rounds of NFFO (NFFO-1 and NFFO-2). NFFO-1 and NFFO-2 contracts end on 31 December 1998, after which generators supported under the first two tranches must sell their electricity in the open market.

With support from the DTI's new and renewable energy programme, RGC has undertaken a programme of negotiations with electricity suppliers and has obtained prices for renewable generators which include a renewable premium. RGC has secured offers from electricity suppliers to all members of the Consortium.

Around 40 generators have so far accepted the offers made to them. RGC believes a significant proportion of the remaining generators will accept suppliers' offers before the end of the year.

The contracts show, says Energy Minister John Battle, not only that the NFFO policy has worked in allowing renewable technologies to develop within a protected market niche, but that "permanent support under NFFO is not needed - renewable energy projects can make the transformation to the open market".

A new tax on the business use of energy?

The Government's Task Force on the industrial use of energy is currently sifting through evidence, gathered from the energy industries and their customers, with a view to recommending if a new tax on the business use of energy or a system of emissions trading is needed to boost efforts to meet carbon reduction targets.

Chaired by Sir Colin Marshall, the Task Force issued a consultation paper in June which identified these two types of 'economic instrument' - either or both of which may be required to give the Government a chance of meeting its international obligations to reduce emissions of carbon dioxide. While the Government can legislate to reduce emissions, and/or enter into voluntary agreement with industrial sectors, it is widely believed that business would respond best to a financial measure.

Market instruments ought to be effective, says Marshall, as, "by raising the cost of emissions they create incentives for business to reduce emissions in the most efficient way possible".

The Task Force intends to report its finding to the Chancellor - who first announced the formation of the group in his budget speech in March - in November. Shortly after the budget the Government's Advisory Committee on Business and the Environment (ACBE) added its weight to calls for a new carbon task, so long as this does not lessen UK competitiveness and that its revenues are recycled.

Thus the concept of a new energy tax is being considered seriously in the UK for the first time, despite having been on the European agenda for a decade or more. Many of the responses to the Marshall paper are thought to favour emissions trading over a new tax but, as ACBE first suggested, there may be room for both.

New forum on power quality

Electricity suppliers and major users who need their supplies to be free of unnecessary interruptions and disturbances are being invited to join a new Power Quality Forum, set up by UK energy company EA Technology.

The first meeting of the forum will be a one-day event at EA Technology's headquarters in Capenhurst, near Chester, on 15th October. Members are expected to meet twice-yearly thereafter and also to receive a twice-yearly newsletter.

Issues covered by the forum will include: industry standards and definitions, responsibilities of customers and suppliers, measurement techniques new and emerging technologies for power quality support, and case studies.

Contact EA Technology's Systems Division, tel: 0151 347 2444.

Bradford-based textile group Illingworth Morris has renewed its contract with Eastern Natural Gas (ENG) as gas supplier for its wool processing division, Woolcombers (Processing) Ltd. ENG's Siteworks Team has worked with the group on an extensive programme of building and engineering works at the 11-acre Bradford plant, including converting the main heavy fuel oil boiler to run on natural gas, in addition to supplying the site on an interruptible contact basis.

This conversion had implications for the workings of the whole plant, with elements of the system being upgraded by Transco and managed by the ENG Siteworks Team to increase their efficiency in line with the more effective boiler. Various off site pressure mains needed attention, as they did not previously have the capacity to cope with the amount of gas coming through the system.

The site, which processes raw wool for use in the textile industry, uses approximately two million therms per year in its operations.

BP merges with Amoco

Britain's BP and the US-based Amoco have agreed to join forces by an agreed merger to create one of the strongest international energy and petrochemicals groups in the world. The new company - to be called BP Amoco plc and headquartered in London - will be Britain's largest and one of the world's top three oil majors.

The executive management of the new company will be headed by BP chief executive Sir John Browne and the board co-chaired by BP chairman Peter Sutherland and Amoco chairman Larry Fuller.

The move is being seen as a neat merger of BP's strong track record in the upstream arena and Amoco's success as a key US downstream player. It is also expected to lead to cost savings of some $2 billion a year in these times of rock-bottom oil prices.

Northern establishes metering services for major users

The Major Energy Users' Council (MEUC) has agreed a new model contract with Northern Metering Services Limited - part of REC Northern Electric - for the provision of electricity metering services and data collection to MEUC members across the UK.

The agreement is expected to provide subscribing MEUC members with substantial savings in their metering and data collection costs. Key features include, say Northern:

- a single point of contact for data collection and metering operations so there is no scope for confusion of responsibilities,
- flexible start dates for services to suit the customer,
- the ability to add new metering sites and remove existing sites from the agreement at any time and without penalty as is often the case currently,
- compensation for non-performance.

Peter Bennett, Managing Director of MEUC Services said: "The Government has made it clear that it wants companies both the compete and to co-operate at appropriate times and this new model contract is a good example of a number of organisations coming together to achieve lower prices and a better service for customers while at the same time they continue to compete against each other."

Arcadia, P&O Cruise's British superliner, has been refitted with a nickel-cadmium (Ni-Cd) emergency lighting standby battery said by supplier Alcad to be more reliable, more robust and needing less maintenance than the previous lead-acid battery. The 63,500 ton vessel - originally built in 1989 for P&O's Princess Cruises - joined the P&O Cruises fleet as Arcadia in December last year, and returned to Southampton in April from her first round-the-world cruise following a £14 million refit at Harland and Wolff in Belfast during autumn 1997.

During the refit, an eight-year-old lead-acid battery backing up the ship's 60 kW, 220 V emergency lighting system was replaced with a new battery of 173 Alcad XHP 190 cells by ship electrical specialist SC Technical Services of Southport. The battery maintains the ship's emergency lighting for up to 30 minutes until the stand-by generator is started.

New design advice service

A new, free Government design advice was launched last month as a fully integrated part of the DETR's Energy Efficiency Best Practice programme (EEBPp) under the management of BRECSU.

The previous EDAS scheme ended in August. Potential projects which have an anticipated start date after 1 September 1998, can register with the new Design Advice service now.

In order to satisfy the conditions for scheme eligibility, potential entrants need to:

- provide evidence of an intent to build or refurbish a building/group of buildings with a total floor area greater than 500m^2,
- agree that their project can be sued to promote the EEBPp if required, and
- agree to implement the advice received as far as is practicable.

Consultants with expertise in energy efficiency and the environmental design of buildings are also being invited to register their interest in becoming accredited to the new Design Advice service. Accreditation will enable them to provide client consultancies on eligible building projects. ***To register potential building projects, or to register interest in being considered for accreditation with the new Design Advice service, please contact the scheme by fax on: 01923 664787.***

Zevco launches clean transport for the people

Hot on the heels of the Government's Integrated Public Transport White Paper, the Zero Emission Vehicle Company (Zevco) has unveiled the world's first zero emission taxi. This revolutionary 'green' black cab, the Millennium Taxi, is the beginning of a new era in transport technology, says the company.

The new technology has been developed by the British company Zevco at the only fuel cell technology plant in Europe, based in Belgium.

Zevco's electrochemical engine (ECE) combines hydrogen and the oxygen from air to produce electricity and water. The engine uses a fuel cell, which generates power by reversing the process of electrolysis, it then stores the electricity in batteries for use by a powerful electric motor, giving the taxi the same, if not better, performance than traditional taxis.

In addition to its environmental performance, Zevco's fuel cell boasts minimal noise and vibration levels - it is virtually silent - and an equivalent performance to a conventional combustion engine, says the company. In addition, it is economical to run - hydrogen is cheaper than conventional fuel (£6 per day with hydrogen compared to £15 for diesel).

As a result, even though the capital cost is currently a little higher than that of a conventional vehicle - the new taxi costs around £2,500 more to produce than its diesel equivalent - the Zevco Millennium Taxi is already an economically viable proposition.

Britain's first 'green' black cab

Among the commercial markets Zevco is targeting are defined route vehicles such as buses, post office and light rail and commercial delivery vehicles. Zevco is currently working with Britain's biggest bus manufacturer, which aims to produce an operational bus using the hydrogen fuel cell engine by the end of this year, while a postal vehicle has already been built for the Italian Post office.

New package to help 'green' small companies

A new £2 million drive to help small and medium sized firms 'go green' has been unveiled by Environment Minister Michael Meacher.

The new service will:

- revamp its support to small businesses through the Energy Efficiency Best Practice Programme;
- build up a network of locally-based consultants;
- be developed jointly with the Government Offices in the Regions and
- replace the smaller SCEEMAS programme, which has had a very disappointing take up.

Mr Meacher said: "This is part of our continuing efforts to rationalise the Government's support to businesses on energy and environmental performance via the Government Offices in the Regions and other organisations such as the Energy Saving Trust, Business Links, Training Enterprise Councils and local authorities, in providing a more effective support."

For industry, utilities and transport contact ETSU, tel: 01235 436747; for buildings contact BRECSU, tel: 01923 664258.

The 770 MW combined cycle gas turbine power station at Rocksavage, near Runcorn Cheshire is said to be Britain's most efficient, operating at 58% compared to earlier CCGT efficiencies of around 55% and coal fired plant at around 37%. Built and owned by international developer InterGen, a joint venture between Bechtel Enterprises Inc and Shell Generating Ltd, Rocksavage supplies electricity for ICI's local chlor-alkali plant and Scottish Hydro-Electric, with a surplus exported to the grid.

The plant uses two GT26 gas turbines rated at 240 MW each and a 260 MW steam turbine, all from ABB, and burns 120 million cubic feet per day of gas piped from North Sea fields.

Opened by the Queen in July, the £375 million power plant is the first of three being built by InterGen.

Energy, efficiency

by Dr Brenda Boardman, PowerGen Fellow in Energy Efficiency, Environmental Change Unit, University of Oxford

Prof. John Chesshire presents Brenda Boardman with the 1998 Melchett Medal.

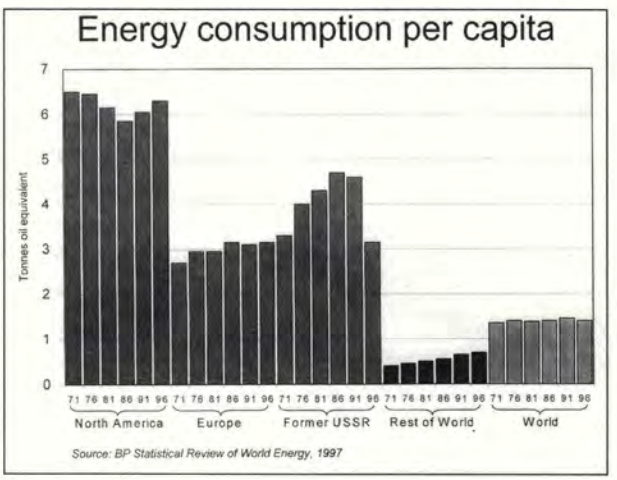
The imperative of climate change has given a new dimension to issues of equity: we need to reduce our impact on the environment whilst enabling many millions of people to obtain a higher standard of living. At the same time, our obligations to future generations are becoming clearer - as stewards of the earth we have to reduce our levels of pollution, so that their world is as pleasant and habitable as ours. All of these objectives can be achieved, with political will and public support, and the more efficient use of energy has a crucial role. In this edited version of the Institute of Energy 1998 Melchett Lecture, Brenda Boardman argues that the prime reason for increased energy efficiency is now to improve equity, between the rich and poor in a country, developed and developing countries and between the present and future generations.

Focusing for a moment on global energy use, at a per capita level over the 25 years from 1971 to 1996 (see Figure 1). The most obvious message is the discrepancy between regions: people in North American use about ten times more energy than people in the rest of the world, with European countries in between. Most recently, energy use in the former USSR has dropped substantially because of the economic recession and this decline is sufficient to offset growth elsewhere. As a result, energy consumption across the whole world is stable on a per capita basis.

The relationship between energy use and carbon dioxide emissions is fixed in the short-term, but not in the longer-term. The biggest variation occurs with electricity as there can be substantial changes in the generating mix, over relatively short timescales. We have recently had the 'dash for gas' and an increase in the proportion of supply coming from nuclear power, so the CO_2 emissions per unit of electricity are dropping. For the main domestic fuels, in the UK, the emissions per unit of delivered energy (energy at the meter) vary by a factor of nearly three (gas 14 kgC/GJ delivered, electricity 40 kgC/GJ). Electricity is the most polluting, because of the conversion losses at the power station. For the other fuels, conversion losses take place inside the house.

Further reductions in carbon dioxide emissions are available from electricity if this is derived from renewable sources of energy - wind, solar, hydro, biomass and so forth. Renewables in the UK are only about 2% of all electricity, though the Government

Figure 1



and equity

has set a target of 10% by 2010.

Current greenhouse gas emissions from the UK are below the 1990 level and the UK is expected to be one of the few countries to comply with the targets agreed in Rio. Last December, at the Kyoto discussions, the Europe Union undertook to reduce emissions of greenhouse gases by a total of 8% below the 1990 level by 2010. The UK Government is still stating that emissions target for the UK should be to reduce by 20% by 2010. This is a challenging and noble target.

Over the 20 years 1974-1994, in the domestic sector, the efficiency of energy use in the home has changed. The heat loss through the building fabric has been reduced so that energy consumption has declined from an index of 100 in 1974 to 77 in 1994: the building fabric is now 23% more efficient. The same has occurred with the heating system inside the building, and that is now 17% more efficient. However, over the last 20 years we have installed many new appliances in our homes, more lights as well, and all of these are being used more frequently. So the energy consumption in lights and appliances has gone up 29% from the level in 1974. The combination of the 77, 83 and 129 at a household level gives us a figure of 93 for average household energy consumption. We have reduced energy consumption by 7% in the average household over the last 20 years.

Over this time period, the number of households has increased by 23%. When this is combined with the household index of 93, the total consumption of energy in the whole domestic sector in the UK has risen a total of 15% over these 20 years, despite considerable efforts at improving our efficiency, particularly of the building fabric. In comparison, we have to reduce our emissions of carbon dioxide by 20% by 2010. Our recent progress on energy efficiency in the domestic sector has been slow.

Heating expenditure for a low income, pensioner couple in council accommodation

Present	£6.65	
For adequate warmth		
a)existing poorly insulated home		
• poor heating system	£16.15	+ £9.50
• efficient heating system	£10.35	+ £3.70
b) well insulated home		
• efficient heating system	£5.65	- £1.00

Figure 2

Efficiency alleviates poverty

The benefits of energy efficiency have not unfortunately reached everybody to the same extent, and certainly not adequately. If we look at the problem of fuel poverty, which as many of you will know is a subject dear to my heart, there are many people who are cold, because their homes are too inefficient to heat adequately on their incomes.

At an individual household level, the situation for a low-income pensioner couple in council accommodation illustrates the problems graphically (Figure 2). At the moment, they are spending £6.65 a week just on heating. If they are to be adequately warm, in that existing house, without any capital expenditure, they would have to pay more than double - up to £16.15. That is because they have both a poorly-insulated house and an inefficient heating system. If you were to install the most cost-effective measure, a modern and efficient heating system, that would reduce the extra that they have to spend to only £3.70 a week. If there was sufficient capital to make it a well-insulated home in addition to having a modern heating system, then the couple would not only be adequately warm and healthy, but also saving a £1 a week.

That is the real benefit of energy efficiency. It allows you to reduce energy consumption as well as provide a better level of service. The downside, of course, is that it requires considerable capital expenditure and the figure is estimated to be about £2,500 for the average house - a £billion annual programme for many years. The key to improved energy efficiency is capital expenditure, but, by definition, the poor do not have the capital. Instead of helping low-income households obtain affordable warmth, we are letting them live in these houses where they have to purchase extremely expensive warmth. With energy efficiency improvements we would be able to give them cheaper warmth, similar to the standard most of the rest of us are able to obtain.

Unfortunately, a considerable number of households in Britain suffer from fuel poverty. We are making progress, at a political level - at least the problem is now recognised, whereas in 1985 the then minister Peter Walker refused to even acknowledge that there was any validity in the term. He had completely misunderstood the nature of fuel poverty and the crucial role of capital investment. When I buy a dress, it is because I want a dress. When we buy electricity or gas, we want a warm, well-lit homes. This can only be obtained through a piece of equipment - the central heating boiler or a light bulb. To improve the efficiency of this equipment requires capital. Fuel poverty is created by a lack of capital and that is why it is different.

In her recent statement at a National Right to Fuel Campaign conference, Angela Eagle acknowledged that, just in England, there are about 7 million households in fuel poverty - equivalent to over 8 million households in the whole of the UK. However, in England, 2.5 million are in particularly extreme or severe fuel poverty. We have, at long last, political recognition for the problem of fuel poverty and a clearly-stated objective.

Overcoming fuel poverty is about providing people with affordable warmth. As far as affordable is concerned, it is generally accepted that about 10% of income is the most that a household

Fuel costs for a given floor area (£pa)

NHER	40m²	80m²	120m²
0	1,000	1,800	2,700
1	750	1,325	1,900
2	610	1,050	1,500
3	520	875	1,225
4	460	750	1,025
5	410	650	900
6	370	580	775
7	340	520	690
8	310	460	610
9	280	400	530
10	260	350	450

Figure 3

should have to spend on all energy. The average in the country is about 4-5%, so 10% is more than double the average. The definition of warmth is that the home should be about 18°C, perhaps with 21°C in the living room. You can debate what those actual temperatures should be in which rooms, for how many hours, but we all have the same physiology and find the same temperatures comfortable. If there is a limited amount of income and a fixed standard to reach in the housing stock, the only way that this can be done is through the energy efficiency of the dwelling. For low income households, the level of energy efficiency has to be disproportionately high, if they are to achieve adequate warmth for only 10% of their low incomes. It is because of that energy efficiency improvements are crucial in helping to overcome fuel poverty and Angela Eagle has now given us that commitment.

It is important to recognise the implications of that commitment and the context within which it is being given. At the moment in the UK we have both cold homes and a planet that's warming up. If we give low-income households more money, they will be warmer, because they can spend more on fuel, but the world will be worse off because there will be greater pollution. If the drive to greater energy efficiency were to be through fuel price rises, those that are on a low income suffer. They cannot increase their expenditure, their budget is already too tight. Therefore, they keep their spending at the same level, reduce consumption and are colder. This was the lesson from VAT on fuel. The planet is marginally better off, but solely because of increased hardship. The legacy of inefficient homes in Britain is so great, that energy price rises will be politically unachievable for several years, at least until the worst housing has been removed or improved.

Investing to improve

One of the current debates is about how to raise the capital needed to invest in low-income homes in the UK. With the liberalisation of the gas and electricity markets, the price of gas and electricity are falling. There is therefore a wonderful window of opportunity, to reduce the price to the consumer, but to a lesser extent, and to slip in a levy to fund energy efficiency improvements. Let us hope that the Review of utility regulation uses the opportunity in this way.

Direct capital investment in energy efficiency is both better for people - warmer homes - and better for the planet, because there are less emissions. This is route for the UK and, I believe, should underpin our policies to the developing world: the direct investment in efficient, clean technologies is the best way to assist their development. This includes the way energy is supplied as well as the way it is used.

I want to examine the effects of energy efficiency a little bit more closely. At an individual house level, the fuel costs of achieving an adequate standard of services for all uses can be assessed, through the National Home Energy Rating (NHER) - see Figure 3. This is a more detailed way of measuring all energy use than the SAP system. With NHER, 0 is the most inefficient and 10 is the most efficient and all of these sums of money are to provide exactly the same standard of service to the occupants.

The total energy costs, per year, are given for three dwelling sizes, a 40 m² dwelling is a one-bedroomed flat and 80 m² is an average house in the UK. A 120 m² dwelling is a detached house. Using these three sizes of house, the range of energy costs across the housing stock is a factor of 10, from the most efficient small flat to a larger-than-average, extremely inefficient house. Sometimes it is appropriate to think of people moving from large to small dwellings, for instance if a single pensioner leaves the family home and goes to a purpose-built sheltered housing scheme. Keeping within the same house size, the cost of keeping warm and other energy services could be reduced by 85% (when the standing charge is taken into account) if those that live in the worst houses could have the most efficient.

The average English house has an energy efficiency rating of about 3.5 on the NHER scale, so the energy consumption for this average 80 m² house could be reduced by 63% by improving it to a level of NHER 10 for no drop in the standard of living whatsoever. It would actually be a far nicer home. The opportunities to save energy are there, particularly if we use the framework available with energy audits.

The final point about this Figure is the way it demonstrates clearly the cost of warmth: it is expensive to keep warm in inefficient homes and yet that is where the poorest people live. An inequitable situation.

Figure 4

Range on the current UK market (kWh pa per household)

	Market best	Market worst
Fridge freezer	330	970
Lighting	320	820
Dishwasher	260	530
Oven	150	350
Tumble dryer	210	250
Washing machine	140	510
Total	1410	3430

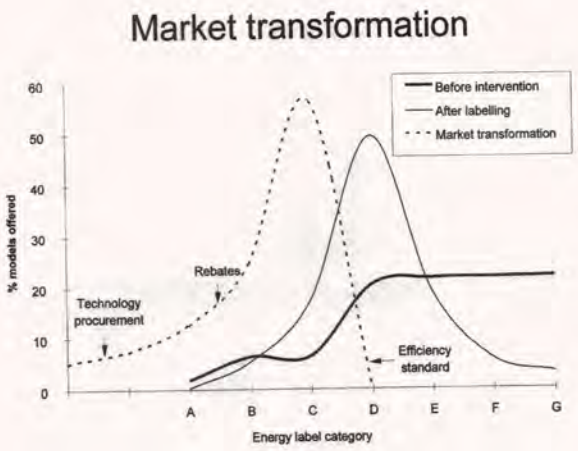


Figure 5

Better appliances

There are similar discrepancies and opportunities in other areas. Taking the example of a standard refrigerator, if the refrigerator in the average house has an index of 100 and the householder went out and replaced that with an average new one from the shops, it would consume 84 units. With the aid of the European Energy Labels that exist, the householder could identify the best refrigerator on the market in the UK, with a further drop in consumption to 44 units. If the purchase was the best in the stock anywhere in Europe, the index would be down to 26 units. That is a 74% saving in energy, for absolutely no drop in the standard of service whatsoever. And certainly, with many of the appliances between the 84 and 44, the efficient appliance can be bought for no extra cost.

This situation is replicated across a whole suite of domestic products. The range between the best and the worst new models in the shops is a difference of 2000 kWh a year (Figure 4). The European Union's Energy Label is already displayed, at the point of purchase, on fridge-freezers, tumble dryers and washing machines. Labels for light bulbs and dishwashers are coming soon and the Environmental Change Unit is contributing to a study on ovens. With lighting, in this example, the range is for a household with only incandescent lights in comparison with one where 80% of the bulbs have been replaced by compact fluorescent bulbs. So by using the market carefully, by using the technologies that are there, a householder could save 60% of the energy required by someone with the worst appliances. In both cases, the standard of energy service obtained is the same.

The debate about more efficient appliances must not exclude a similar debate about whether these appliances are needed at all - it is still a good standard of living for many households to use a solar tumble dryer - the washing line.

Transforming the market

The way to deliver these energy savings is a strategic policy approach, recognising that the benefits from interactive policies are greater than the sum of the parts. This strategic approach is often referred to as 'market transformation', because the objective is to speed up the delivery of more efficient technologies, beyond the rate the market would deliver on its own (Figure 5). In all cases, the first priority is to be able to rank the product or service in terms of efficiency. The EU Energy Label does that for appliances and the SAP and NHER perform the same function for houses - that is the x-axis.

Initially, the products on the market are skewed towards inefficiency: there has been no focus on efficiency. With the example here of refrigerators and freezers, that is the thick black line. After labels are introduced, there is the opportunity, as here, to train the retail staff and stock the shops with more efficient equipment. This is what Scottish Hydro Electric did in the 55 shops summarised in this slide. The transformation to the middle distribution - the thin solid line - took 6-8 weeks. The models available in the shops were significantly more efficient. In the longer term, the aim of a market transformation strategy is shift the curve further to the left, through encouraging the development of more efficient technologies, rebates to consumers to encourage the purchase of the best equipment and eventually bringing in a minimum efficiency standard.

The British Government and the European Union are both adopting a pro-active approach to market transformation in the domestic sector, particularly in order to obtain carbon dioxide reductions to support the Kyoto targets.

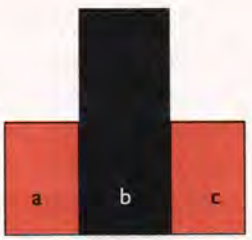
Energy equity

Within the different contexts for energy use, there are numerous opportunities for the more efficient use of energy to benefit the disadvantaged.

At the moment the low-income households, the poorest households, are using energy inefficiently - they are block A on Figure 6. They are using relatively small amounts of energy and they have a low standard of heating and other energy services. In comparison, the better-off households, the B group, have higher consumption of energy. They use it with a medium level of efficiency, not especially high, but they have a much higher standard of energy services. They are adequately warm. The C group have the same standard of energy services as the B group, but use energy more efficiently and so have a lower demand. The expectation is that policy should be moving the Bs to C, in order to reduce energy consumption and pollution.

On equity grounds we should also be thinking of moving A direct to C as well, and accepting that despite the fact that they have a low level of energy services at the moment, despite the fact that they are cold and will not take the benefit as saving - there will be no energy saving - we have also got to move the As direct to C through improving their efficiency,

Figure 6



Energy use	low	high	low
Efficiency	low	medium	high
Energy Services	low	high	high

so they are able to have cheap warmth.

In fact, the CO_2 emissions from A and B are approximately the same, partly because of the inefficiency in low-income households but also because the A households are using much more coal and oil and electricity than the B households, who are predominantly gas users. So on environmental and equity grounds, we have the incentive to help the poorest households become better off, both in terms of their services and in reducing their pollution. It is not sensible to wait until they cause even more pollution (the B standard of energy use) before intervention takes place.

I think the same is true of rich and poor countries. What is needed is a disproportionate level of investment in low-income households and in poor countries in order to make sure that they have the maximum level of energy efficiency and can obtain the services that they need with the least level of pollution.

Finally, there are hopeful signs - we are beginning to be rational residents of this planet. The sales of compact fluorescent bulbs have gone up more than five-fold in seven years, particularly due to production in China. The compact fluorescent bulbs in use in 1995 saved the electricity equivalent of the output of 28 large, coal-fired power plants, because each CFL saves at least a third if not a quarter of the energy to give the same level of lighting. We are also installing more renewables, in addition to the traditional hydropower and use of biomass. The opportunities for wind energy are being recognised and wind energy generating capacity, for example, grew from zero in 1980 to 7.6 GW in 1996. There is sufficient potential for wind in just three American states to generate all the electricity needs of the whole of the USA. So let us hope that we are heading for a greener world that is more equitable for the present residents and for future generations.

Contact Brenda Boardman, tel: 01865 281211, fax: 01865 281202, website: www.ecu.ox.ac.uk

Leasing affordable warmth:

by Jenny Saunders, NEA

The Government may finally be taking seriously the problem of 'fuel poverty' suffered by millions, but there is much to be done before financial barriers are overcome. Here, NEA's Jenny Saunders reports on a recent project carried out in Leeds in which the leasing of heating equipment - rather than its purchase - might point a new way forward.

It's all about people - one of Leeds City Council's tenants

Angela Eagle MP, who until the July reshuffle was the government minister responsible for energy efficiency, introduced a new debate seeking to fuel poverty and to explore new policies to reduce it: "I want to encourage a real national debate ..... with a willingness to think radically about the best interests of the people in greatest fuel poverty" (May 1998).

The English House Conditions Survey 1996 has helped to focus this debate and has led to grades of fuel poverty suggested by Angela Eagle ranging from:

- Extreme: households who would need to spend over 30% of income on fuel to heat their home to a satisfactory level (1 million households)
- Severe: households who would need to spend between 20% and 30% of their income on fuel to maintain adequate temperatures (1.5 million households)
- Fuel poverty: households who need to spend over 10% of income (4.5 million)

The English House Conditions Survey indicates that 2.5 million households (13% of all households in England) have living room temperatures during the winter months which are considered to endanger health, and the level of energy efficiency of homes occupied by the fuel poor is half the national average.

The Department of Environment, Transport and the Regions (DETR) which co-ordinates the Government's cross-departmental working group on fuel poverty has invited views on how to assist people in greatest fuel poverty. Although Angela Eagle conceded that it may be an expensive exercise, she said she was willing to think radically about new approaches because "the social and environmental rewards would be really worthwhile". NEA hopes that Alan Meale, her successor at DETR, will continue this radical approach.

NEA has worked in the fuel poverty field since it was established in 1981. It has always had as its prime objective the best interests of the fuel poor, and has developed not only policies and strategies to tackle fuel poverty, but has also demonstrated through local initiatives new approaches to deliver energy efficiency services and advice to people on the lowest incomes.

NEA recognises the political framework within which we all have to work and balances its long term campaigning role with a pragmatic approach to bring about increased resources for energy efficiency improvements for low-income households in the short term. Committed to a manifesto for warm homes for all, it works in conjunction with a wide range of agencies across all sectors. It supports the Warm Homes and Energy

a new approach to tackling fuel poverty

Conservation Bill - a 15 year programme to assist the 8 million households dependent on Government benefits as their main source of income at the same time it strives to deliver practical help to people in need now.

The solution to fuel poverty does not lie merely in improved insulation levels. The problem in a high number of low-income households is that of expensive to run, inefficient heating systems; a lack of heating controls; or just a lack of heating appliances.

The DETR should consider as part of its radical rethink of how to tackle fuel poverty a recent NEA demonstration project delivered in partnership with Transco and piloted in Leeds.

Leeds City Council has established that as many as 44,000 of the 76,000 properties it owns are underheated, many lacking adequate heating systems. But with restrictions on local authority spending on capital improvements, new ways of financing new heating systems need to be explored.

Heat leasing agreements for gas central heating are not allowed in the current legislative framework in England and Wales, although similar leasing agreements are allowed for electric heating. The argument hinges around whether gas central heating systems can be portable, 'chattels' rather than 'fixtures'.

It is clear that fixtures cannot be leased, but with the addition of isolating valves on the radiators and boiler, a gas central heating system, apart from the under floor pipework and the radiator brackets, just might be deemed portable.

Property type and original heating (additional to gas fire in living room)	SAP rating		Estimated heating costs (£)	
	Before	After	Before	After
3 bed semi (electric heating used extensively)	28	72	1600	643
2 bed semi (gas convector heater and some electric heaters used)	30	76	750	402
2 bed semi (portable LPG heater used)	13	67	838	518
lower flat (some electric heating used)	21	60	692	325
upper flat (no other heating used)	24	66	585	309

Improvements to SAP ratings and reductions in fuel costs

In any case, leasing both gas and electric central heating systems are allowable under Scottish regulations. With the Government introducing changes to local government finance, now is a good time to investigate the potential for clarifying the legislation with regard to leasing gas heating systems.

The Leeds project explored how affordable warmth can be provided to tenants on low-incomes by using leasing to replace capital spending and to demonstrate a model scheme that could be put to the District Auditor as a test case for approval.

Finance for a scheme to improve 50 underheated dwellings on one housing estate was provided by Lombard Business Finance in an agreement with Leeds City Council and Transco. Crucially, Transco agreed to underwrite the costs to Leeds City Council if the District Auditor's approval was not subsequently granted. A decision is still awaited following the completion of the project in May.

It was important also to ensure that any increase in rents introduced by the Council to cover the cost of installing and leasing the heating systems would be offset by savings in fuel bills. These savings were estimated through National Home Energy Rating (NHER) surveys and at the same time balanced with the increased comfort levels of the households.

For this reason, and to demonstrate good practice in estate improvement, the project undertook to provide a complete affordable warmth package. In addition to the modern central heating system, this included installation of insulation measures and draughtproofing, as well as energy advice to tenants in their homes and training housing staff to provide a continuing source of energy advice on the estate following the completion of the project.

A final report on the project published by NEA outlines the outcomes and describes the details of the work carried out: the table below indicates some of the expected savings in terms of reduced expenditure on fuel and the increased energy efficiency levels of the properties.

What is still to be resolved, however, is the financing arrangements. NEA has suggested that this is considered under the DETR's 'radical' review of ways to tackle fuel poverty, and hopes to engage in a full and meaningful debate with a number of departments who are essential in ensuring that the Government can deliver its commitment to assist households in greatest need.

Contact NEA on tel: 0191 261 5677, fax: 0191 261 6496.

The ecological building centre - environmental technology for the 21st century

The new Construction Resources Centre in London SE1 - only three minute's walk from the Shakespeare Globe Theatre

Opened in May this year, Construction Resources is a new ecological building centre located in London. Unique in Britain, the centre is dedicated to promoting and distributing environmentally sound building materials and system, including many low energy and renewable products and systems. The range includes state-of-the-art products from all over Europe, selected to produce sustainable, healthy, high-quality buildings for living and working.

The project is the brainchild of Richard Handyside, and arises from a lifetime of personal interest in buildings, the environment and renewable energy. The past five years setting up Construction Resources has involved researching and travelling extensively to visit conventional and ecological building exhibitions, to attend conferences and to talk with manufacturers and specialists across the Continent and America.

Richard explains his philosophy: "Fifty percent of the carbon dioxide released in the UK comes from buildings. To come anywhere close to our very modest national target of reducing CO_2 levels by 20% by the year 2010 we must find ways of reducing the emissions from buildings. Using ecological building materials and maximising the use of renewable energy in residential, commercial and industrial buildings will bring us closer to that target."

"In today's political and economic climate it may be too much to hope for the kind of subsidies that have made Holland, for example, one of the leading countries in installations of solar water-heating systems in large-scale housing developments. Actually it shouldn't really be too much to hope for, since as well as significantly reducing CO_2 emissions, the Dutch programme has fostered the growth of a thriving new industry with international success."

"What the Government can do tax-neutrally - and what only the Government can do - is to adjust taxation so that full, true environmental costs are attached to all building materials and systems."

"True environmental costs include everything from the extraction of raw materials through processing, manufacturing, installation, use in buildings and, not least, safe eventual disposal. They also include fuel costs priced on the same basis. If all materials were made to carry these true costs, ecological building would be the only affordable kind of building ñ as of course it is now, if looked at in terms of our own environment and the environment we are leaving for future generations."

This is the basis for selection of products at Construction Resources. Selection criteria start with high quality and high performance, but include all the factors of a life-cycle environmental cost analysis, from the sourcing of raw materials, to the energy and pollution costs of manufacture and transport, running and maintenance costs, and eventual recycling or safe disposal.

The products range from unfired clay bricks and renders through natural insulation materials such as flax, wool and wood fibre, to rainwater harvesting systems, in-wall radiant heating, wood-fired heat storage stoves, solar water and space heating, and advanced energy control systems. The list continues with natural paints and finishes, floor coverings, furniture, tools and equipment.

Solar heating systems

Solar heating is one of our specialities and we have recently supplied 24 Zen Aquasol Duo solar water heating systems for a housing association project part-funded by the European Commission. Introduced into Britain from the Netherlands by Construction Resources, the Zen Aquasol Duo system is the result of 20 years' development and has been thoroughly tested by installation in thousands of homes within Holland. A combination of intensive development by the manufacturers and a well thought-through subsidy programme from the Dutch government has brought the cost of a complete system down to around £1700.

The Zen system meets at least 50% of the annual hot water needs for the small to average home (two to four people). Local authorities and housing associations in the UK are particularly interested in this affordable, well-proven and high performance solar system.

In contrast, the ES Solar Roof actually

replaces the tiles, slates or other materials covering the roof. Simple and fast to install, the ES solar roof is a series of collector plates with sealed joints, and forms the complete replacement covering for all or part of the roof. The collector roof can even be curved, which allows flexibility and attractive design options.

Construction Resources also supplies a unique passive solar heating system, the ESA Solar Facade. This happy combination of simple materials with high technology uses a cardboard honeycomb applied to south, east and west-facing external walls under standard single glazing to capture solar radiation. The radiation is turned into heat inside the honeycomb, and this is transmitted to the thermal mass of the building, where it is stored during the day and gradually released into the rooms later. At night the cardboard honeycomb acts as an additional insulating layer, slowing down the rate of heat loss from the building.

Natural thermal insulation

The range of natural insulation available at Construction Resources is another example of energy efficient and energy conscious products. They include flax, wool, hemp, recycled newspaper, wood-fibre, coconut fibre and cork. Their harvesting and manufacture use very little energy compared to most conventional materials, and at the end of their life they can be recycled or composted. They also have other benefits in addition to the thermal insulation properties that are every bit as good as the synthetic products which they replace. They are comfortable and healthy to work with, and they are generally good for acoustic insulation as well.

Their most special quality, however, is that unlike conventional materials they can absorb significant volumes of moisture without losing their thermal efficiency. As a result, they make a strong contribution towards a healthy, comfortable living and working environment, by absorbing excessive humidity and releasing it bck into the building when the air dries out.

Everyone knows wool as a warm, insulating material, but CR Wool for building insulation may come as a surprise to some people.

CR Wool is sheared from Austrian mountain sheep that have not been dipped in any of the pesticides that are being linked to farmers' health problems in Britain. Samples of the wool are tested regularly to ensure the absence of a long list of hazardous chemicals. The raw wool is washed and treated with borax to make it resistant to fire and insects, then carded into slabs or rolls of various depths for installation as insulation.

Not only does it retain its thermal properties when damp, but it will absorb moisture from adjacent building elements and help prevent deterioration to structural elements. It can hold up to 40% of its own weight in moisture without losing its insulating properties.

EMFA coconut fibre insulation mats are used under floors to absorb sound, providing a very effective natural alternative to petrochemical-based foamed boards.

Gutex wood-fibre products use waste material from Germany's Black Forest sawmills to produce boards in various forms for roof, wall and floor insulation - including a 6 mm wood-fibre carpet underlay.

Isofloc cellulose insulation is made from recycled newspapers, and is supplied compressed in paper sacks. For wall, ceiling and roof cavities it needs to be professionally blown in or damp-sprayed, but it is also available for loose fill in attics.

Homatherm insulation batts are also made from recycled newspaper, with recycled jute sacking for reinforcement. It is the only cellulose-based insulation product available in slab form, making it easy for one person working alone to install it between wall studs, for example.

The flexibility of another natural insulation product, CR Flax, enables it to solve more awkward insulation problems quickly, without time-consuming cutting to shape for use in insulating walls and ceilings. It offers excellent thermal and sound insulation properties. Buildings using flax insulation are cosy, healthy and fire-safe and have good moisture absorption properties which prevents deterioration of the building structure.

A mixture of hemp and flax is also available, specially developed as a high-performance natural substitute for mineral wool used for sound insulation in stud walls.

The Centre

The Construction Resources building, close to the centre of London, has displays on three floors, including large-scale construction models and working demonstrations, together with a seminar room, a training and demonstration room, and a separate trade sales counter and warehouse. Products can be bought directly from Construction Resources, but the intention is that many of them will in time also be available from builders' merchants and other appropriate outlets around the country.

Contact Construction Resources at 16 Great Guildford Street, London SE1 0HS, tel: 0171 450 2211, fax: 0171 450 2212.

Cut-through displays clearly demonstrate the products in use

The latest addition to a series of distinctive buildings at the Doxford International Business Park near Sunderland is the Solar Office, which includes what is claimed to be the largest integrated photovoltaic wall in Europe. The entire south facade combines clear glass panels and electrically-operated solar blinds and vents with PV panels to generate between a quarter and third of the building's total electricity requirements. And, while provision has been made for the fitting air conditioning equipment, the building is designed to use natural ventilation and night-time cooling to minimise it use.
The building includes an active PV cell area of 530 m², supplied by the Milton Keynes-based SCHUCO International.
The developer estimates that, once the building is tenanted, the PV panels will reduce the annual electricity bill by some £20,000 a year, with an additional £30,000 a year being saved in reduced maintenance costs.

'Green' mortgages encourage high energy ratings

A first time housebuyer in Lincolnshire has become the first in the UK to purchase a new home using a 'green' mortgage. The Norwich and Peterborough Building Society is the first mainstream lender to encourage energy saving by offering homebuyers a special scheme with favourable conditions. The special deal includes a 2% discount from the Society's variable mortgage rate for two years and higher income multiples.

Martin Walker has bought his three bedroom semi-detached house in Sturton by Stow, near Lincoln from a local builder, Gelder Ltd. Mr Walker said that the house's high rating - a home energy rating of 92 compared to an average for new homes of 70 - was a key selling point. Reduced energy bills and the special terms of the mortgage should save him around £1,000 in the first year.

The Government currently encourages the building of new homes with an energy rating of over 80 and environmentalists are backing proposals to make it compulsory for mortgage lenders to assess energy efficiency when carrying out valuation surveys.

Construction work on a 'house of the future' commissioned by the BBC Television's Tomorrow's World team is almost complete at the Building Research Establishment near Watford. The house, which incorporates a host of intelligent and green technologies, will feature in a six programme series to be broadcast early next year. The experiences of a family living in the house for a week will be the subject of the final programme.

The house has been developed under the INTEGER Project to investigate the use of new features in homes and to create a radical and popular model for new mainstream housing. The project has been supported by the Building Research Housing Group, which comprises many of the UK's most innovative local authorities and housing associations.

New lighting saves energy

GKN Driveshafts is having much of its lighting equipment replaced, by the Winchester-based Parkersell Lighting and Electrical, as part of a quality improvement initiative that is expected to save the company nearly £40,000 a year in energy costs. Some 756 triple tube fluorescent lamps in the factory are to be replaced with nearly 1,000 twin tubes and illuminance levels at the factory will be increased to at least 500 lux.

GKN's quality improvement team identified potential cost savings by replacing 15-year old triple tube fluorescent lighting at its factory site in Aldridge, West Midlands. As well as being dirty and inefficient, the old lighting was unsafe: it suffered from overheating problems and tubes sometimes fell to the floor.

The company also found that a lot of energy was being wasted due to a lack of control of its lighting. Despite receiving a high amount of natural light in the factory, many lights were left on unnecessarily. The new lamps will be controlled by photocells to help reduce usage.

The company, which manufactures propeller shafts for rear-wheel and four-wheel drive vehicles for customers including Jaguar and Land Rover, expects a payback on the investment within three years.

Correcting power factor at Camelot HQ

Power factor correction (PFC) equipment installed by Camelot Group, operator of the national lottery, at its Watford headquarters will increase electrical efficiency and eliminate a surcharge levied by the electricity supplier. Supplier ABB says that its 'Advance' automatic PFC equipment - which cost around £4,000 to install - should pay for itself within three years.

Power factor - the ratio between apparent and actual power - is an indicator of the efficiency of a factory or office electricity network. If power factor is low, the electricity supplier's own network - and consequently the power supplied to other customers - can be affected. Electricity suppliers charge less to businesses that improve the power factor of their networks.

Equipment such as computers, fluorescent lighting, motors and welding gear tend to worsen power factor; it can be corrected by installing capacitor banks at appropriate points in the network. ABB Power T&D Capacitor Division estimates that in a typical office building, PFC equipment can reduce the electricity bill by up to 15%.

At Camelot's headquarters, two sets of ABB Advance automatic PFC equipment, with a total rating of 150 kVAr, have been installed.

Is your office an energy guzzler?

The DETR has published new figures for typical and 'best practice' energy consumption figures for office buildings - allowing office workers to discover whether their building is an energy miser or guzzler.

Energy use in offices has risen considerably in recent years largely due to the growth in information technology and other office equipment, air conditioning and the intensity of office use. But, despite perceptions to the contrary, energy efficient offices are not expensive, difficult to manage or inflexible.

Intended for facilities managers and building professionals, *Energy Use in Offices* (ECON 19) is a newly updated guide from the DETR's Energy Efficiency Best Practice programme.

The guide covers four types of office building:

- naturally ventilated cellular offices
- naturally ventilated open-plan offices
- a standard air conditioned office
- a prestigious air conditioned office

Good practice benchmarks and typical energy consumption data are given for each building type, looking at energy used for heating and hot water, cooling, humidification, fans and pumps, lighting, office equipment and catering.

The guide gives the consumption benchmarks in terms of energy, costs and carbon dioxide emissions. It also gives recommendations for installed power densities for fans and lighting to help designers avoid systems which will inherently consume more energy during their lifetime. A step-by-step worked example is included to help non-technical readers compare their offices with the benchmarks.

According to BRECSU's Tony Johnson: "Energy efficient techniques which work well tend to be reliable, straightforward and compatible with management and user needs. The guide helps to identify suitable measures through a series of checklists for different readers, ranging from senior managers to technical specialists. For those about the embark on moving to a new office, advice is given on what to ask for in the design brief or rental agreement. But perhaps the most important function of the guide is to enable readers to compare themselves with their peers in their present accommodation, so that their businesses can avoid the extra overhead of poor energy efficiency."

'Energy Use in Offices - Energy Consumption Guide 19' is available free of charge (UK only) from the BRECSU Enquiries Bureau, tel: 01923 664258, fax: 01923 664787, e-mail: brecsuenq@bre.co.uk

"Smart homes" EU project to control electricity use

Cambridge-based Grant Instruments is assisting Midlands Electricity (MEB) in its collaboration in a £6.5 million European Community project aimed at giving customers more control over their electricity consumption. The ETHOS project uses the latest two-way communications and information technology to enable domestic appliances, electricity meters and controls to talk to one another, when fitted with an EHS (European Home Systems) microprocessor.

Signals with information about cost, weather, day and time are sent down mains cables from electricity substations to a device (the Gateway) in the home which relays it to the EHS. The EHS acts as a link between all parts of the ETHOS system, allowing appliances to activate controls to control room and hot water temperatures.

Electricity consumption is then measured by the electricity meter linked to the Gateway so that data can be sent and retrieved remotely.

The project involves ten partners and many supporters across Europe, including MEB. Field trials are taking place in 1000 homes in the UK, Denmark, Italy and France. If the trials are successful, a range of EHS compatible products and value-added services will be developed and offered to consumers across Europe.

In the UK, MEB carried out 100 trials in homes in Dudley, West Midlands, over a six-month period. However, before the trials could begin, MEB needed to be confident that it could monitor and analyse the data in fine detail, independently of the system itself, including, for example, the amount of energy being drawn by individual storage heaters in any half-hour period.

The answer was found at Grant Instruments in Cambridge, where the Grant Squirrel 1026 logger proved to be sell-suited to the trials.

Incentives to be
a new economic framework to

by Phil Jones, Building Energy Solutions

The Marshall Task Force is due to report its deliberations on a new tax on the business use of energy in November (see Home News - page 5). The Task Force has been bombarded with submissions - including one from energy consultant Phil Jones summarised here. Phil proposes a mechanism designed to promote more efficient use of energy, rather than to limit its use, which could constrain business growth.

He that will not apply new remedies must accept new evils: for time is the greatest innovator
(Francis Bacon)

I am deeply concerned that most organisations have little interest in reducing energy consumption, primarily because there is little incentive to do so as energy prices are low. Although energy efficiency is widely accepted as a worthy cause, it has unfortunately become a very low priority for most organisations. Soundings within the industry, and my own experience, show that the majority of those responsible for energy costs will do little or nothing unless there is a clear economic incentive to take action. Without a radical change, specifically the introduction of economic incentives, I believe the UK will not achieve its targets for reducing energy consumption and CO_2 emissions.

The business community still lives in an environment where the price falls the more energy they consume. If we are to seriously affect energy consumption and CO_2 emissions then this has to be turned on its head. This article shows that it is possible to give economic incentives to those that consume less, without increasing the overall tax burden on business.

Energy suppliers and energy consumers both face a paradox. Suppliers want to sell more energy and at as high a price as possible. Business consumers want more equipment, automation and greater comfort in buildings. These objectives are in direct opposition to energy efficiency. This paradox must be addressed if we are to achieve targets for energy use and CO_2 emissions.

Organisations must be allowed to make their own choice within a framework that provides *incentives* to consume less. Without an immediate incentive, there is no action and a continuation of the long term problem of over consumption. Somehow, we have to make it not just the right thing to do but the most economic thing to do.

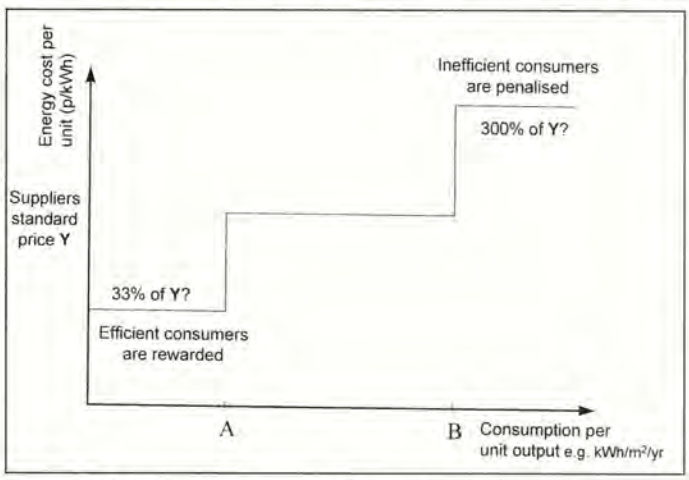


Figure 1 A pricing structure with incentives to promote energy efficiency

THE FRAMEWORK

The answer lies in the energy pricing structure. Efficient consumers should pay a lot less for their energy and inefficient consumers should pay a lot more. In simple terms, energy efficiency can be rated in kWh/m²/yr for buildings and kWh/tonne output for industry. **Consumers exceeding a certain consumption target (in kWh/m²/yr or tonne) would pay a much higher price for energy whilst those using less than another target would pay much less.**

A stepped pricing structure should be introduced to penalise inefficient consumers and reward efficient consumers, similar to Figure 1. The mid range price of energy would be charged at the market price (ie as suppliers charge now). In this example, inefficient consumers would pay three times the standard unit price and inefficient consumers would pay one third. These reward/penalty factors would need to be very significant to ensure appropriate incentive/disincentive.

The step changes (A and B) would be based on energy targets set in relation to the population distribution of consumers energy efficiency, see Figure 2. This shows a typical distribution of say the office sector versus consumption per unit floor area (kWh/m²/yr). It also highlights the upper and lower quartiles of the distribution ie 25% of buildings consume more than B kWh/m²/yr. This relatively standard approach has been used to establish energy targets for a wide range of building sectors and industrial processes. Many of these targets are available from the DETR and other sources.

more efficient - promote energy efficiency

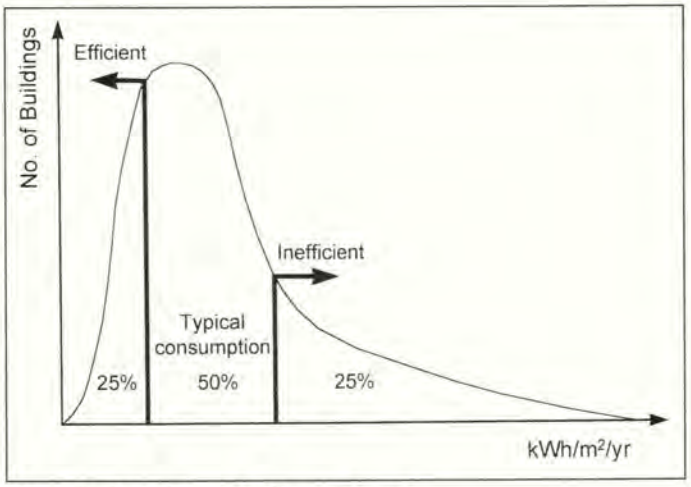


Figure 2 Typical energy efficiency targets

Figure 3 shows these two ideas together; the energy targets are used to set the step changes in the pricing structure. Therefore, the least efficient 25% of buildings pay significantly more than the standard price and the most efficient 25% of buildings pay significantly less. This provides a clear economic incentive to become more energy efficient.

By definition, the approach is roughly tax neutral as 25% pay less and 25% pay more. As the business population gradually becomes more efficient, the energy targets (and price bands) can be tightened. Adjustments in the reward/penalty factors would provide a mechanism for government to manage energy efficiency in the long term whilst still providing organisations with the freedom to make business decisions.

PRACTICALITIES

Energy suppliers would be free to set their own *standard* prices in the same way that they do now, allowing a competitive market to function. Their revenues would remain roughly the same as they would under current circumstance as customers benefiting from the very low price band would be balanced by those in the high price band. Domestic customers below, say 25 kW installed capacity, would be exempt in much the same way they have been excluded from business tariffs in the past. The *standard* price of 'green' electricity (sold as a green product directly to consumers) could be subsidised from a small additional levy on the inefficient consumers through a slight adjustment in the energy target.

The energy targets would be determined for each fuel and for a range of building/process sectors by DETR. These would be based on existing figures and further research to confirm/develop the figures for some sectors as necessary. Medium-term research would identify the necessary changes required to the energy targets as each sector becomes more efficient. Initially, it would be possible to add margins to the targets to make their introduction less severe. The targets could then be tightened gradually with future targets being published in advance to give adequate warning.

The reward/penalty factors would be determined by DETR in relation to the reductions necessary to achieve CO_2 targets. This provides the mechanism for government to implement their energy efficiency policy with scope for adjustments to ensure that targets are met.

The whole system could be under the charge of the energy regulator(s). They would ensure that the reward/penalty factors are levied correctly and arbitrate in any disputes between supplier and consumer. They would also provide the mechanism for adjusting the reward/penalty factors year on year as required by government.

The system would be relatively simple to implement as much of the infrastructure is already in place within the energy suppliers. With some changes to their billing systems, the framework could be administered by the energy suppliers and implementation could be reasonably rapid. The regulators might consider allowing a small administrative charge to go to the suppliers (to be accommodated within the pricing structure) although they should really absorb this as their contribution to energy efficiency.

This approach would require

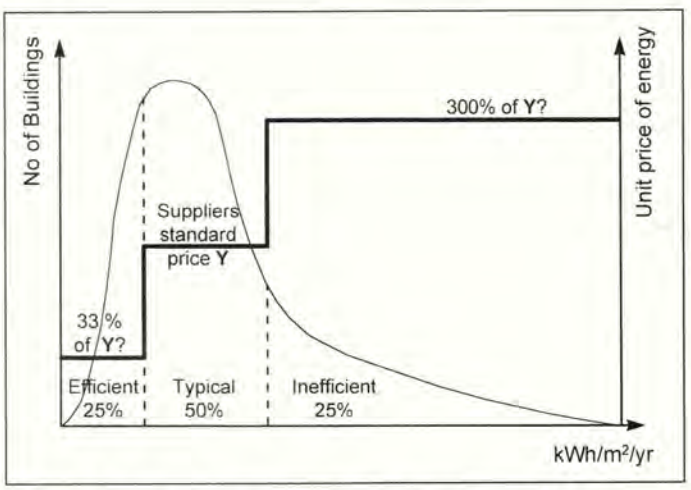


Figure 3 Structuring price in relation to energy efficiency targets

information on the floor area of all the buildings in the country. Much of this is currently available from the rating authorities although it is widely accepted as being inaccurate. A major exercise would therefore be required to gather/update floor area information although this would benefit both the rating system and the energy framework. Initially, the approach could be levied on all buildings over say 3,000 m^2 with a gradual reduction to encompass the whole non domestic building stock.

Industrial processes are often energy intensive and should therefore be levied according to their output (in kWh/tonne output/yr). Energy targets are available for most of the major industrial processes but this approach would require annual information on the output of each factory in the country. Larger organisations already publish this information in their annual accounts and a reporting mechanism could be introduced to submit output figures, gradually including smaller organisations.

The improvement in information about the size and efficiency of the building stock and industry would enhance our understanding of where the energy efficiency problems lie. The information would also have numerous spin off benefits and uses for government, commerce, industry, and UK Plc.

The electricity generating industry would be classed as a separate 'industrial' sector. Input fuel to power stations would be levied on the basis of their consumption per unit of electricity generated, penalising the least efficient power stations and rewarding those with say combined heat and power.

Other measures

Whilst this new approach would provide the necessary incentives to improve energy efficiency, the framework should be supported by a number of other measures:

- Changes to the Building Regulations to improve the design of new buildings and the operation of *existing* buildings.
- Mandatory energy reporting in public and limited company accounts, and in the annual reports of all public authorities, government departments etc. This annual reporting would indicate the environmental attitude and actions of organisations. It would also improve our understanding of the problem and would assist the ongoing research to refine the energy targets.
- All buildings and major industrial processes should be made to keep a log book of performance to be handed on when there is a change of ownership. This should also set out the original design intent and any changes made that effect this.
- Mandatory audits of buildings/processes that fall into the inefficient category for say three years running. The cost of this would be imposed on the offending organisation as a penalty for not taking action.
- Mandatory sub-metering of major buildings and processes on larger multi-building/process sites to improve monitoring of energy efficiency and assist in implementing the economic framework
- The appointment of an energy efficiency czar to co-ordinate the wide range of measures, programmes and activities many of which are cross sectoral, and involve various government departments.

The benefits

By providing an economic incentive to become energy efficient within a competitive market, this framework will allow and encourage:

- Flexibility for government to make changes in energy policy depending upon future environmental concerns. Also flexibility for organisations to invest and save as they see fit.
- Creativity - the UK will become a world leader in creating new ways to monitor and save energy. A whole new energy saving industry is likely to grow to respond to this new framework, bringing employment and overseas contracts.
- Competition - between energy suppliers but also between new companies helping to save energy.
- Integration - this would be the first time that the supply-side and the demand-side would be working towards common environmental objectives.
- Information - improve the quality and flow of information on consumption and return on investment in savings. This would lead to a better understanding of the problems involved and the possible solutions.

Conclusions

Both the Government's Advisory Committee on Business and the Environment (ACBE) and the UK Round Table on Sustainable Development have called for a strategic framework for business with clear environmental objectives. The recent DTI Green Paper reviewing the utility regulators role also recognises the need to set a framework for the utilities in relation to environmental objectives. This strategic framework has been one of the key things missing over the last 10 years.

Such a framework would provide consumers with a much greater economic incentive to reduce energy consumption and CO2 emissions. It is designed to be tax neutral whilst still allowing a competitive market to function normally. This approach would be relatively simple and cheap to implement through the energy suppliers and would ensure their direct involvement in energy efficiency. The framework would require relatively little investment or administration from government whilst providing an adjustable mechanism for implementing a long term energy efficiency policy.

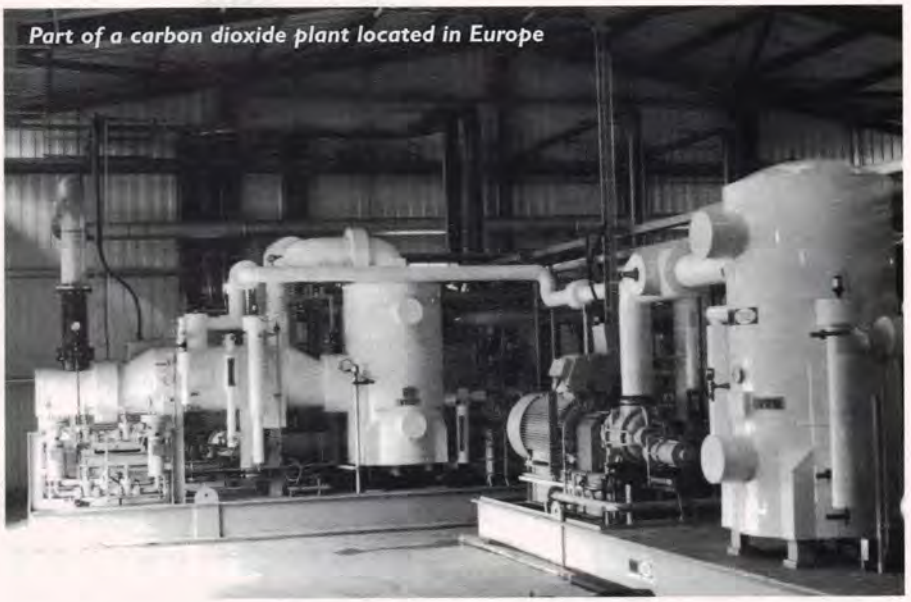
The Marshall consultation paper and the CBI have already expressed concern that a tax on energy consumption might stifle growth. This framework, based on energy efficiency, would promote growth and meet our CO_2 target.

Contact Phil Jones on tel: 01737 371 994, fax: 01737 371 918, e-mail: phil@build.demon.co.uk

Carbon dioxide - it's capture and uses

by Wayne Youngs, Toromont Process Systems

As the main greenhouse gas produced by the energy industries, some of the properties and problems of carbon dioxide are well-known to readers of Energy World. But CO_2 is also produced by a variety of industrial process and has many uses in industry. Here, Wayne Youngs describes the operation of liquefaction plant and the commercial uses of carbon dioxide.



Part of a carbon dioxide plant located in Europe

With the increase awareness in global warming over the last few years, the effects of carbon dioxide on the atmosphere have become more of a concern. In an effort to reduce these emissions some organisations and companies are collecting the carbon dioxide produced as the by-product from other processes and liquefying it for re-use in other applications. This can only be done realistically when CO_2 produced on a large enough scale to make the investment in the liquefaction plant worthwhile. For industrial processes this can be from about 6 tonnes per day up to over 1,000 tonnes per day.

Toromont Process Systems has been designing and manufacturing carbon dioxide plants for clients around the world for decades.

Common sources of carbon dioxide are ethylene glycol plants, hydrogen reformers, petrochemical processes, fermentation off - gases, hydrocarbon fuels, combustion products and natural CO_2 wells and springs.

The liquefaction process

The following is a short explanation of the process units typically required in CO_2 plants.

Inlet cooling - the pre-cooling and initial clean-up stage. CO_2 is usually received from the source at a temperature between 25°C and 65°C, saturated with water. The gas is usually cooled for the purpose of removing the bulk of the contained water and water soluble components.

Compression - CO_2 compression is usually performed in two stages from approximately atmospheric pressure to a pressure in the area of 19-21 BarA with intercooling between stages. Screw compressors were first used for food grade CO_2 compression in 1981; they have since become the standard of the industry.

Oxidation - this stage is typically not required unless heavier hydrocarbons are present in the CO_2 stream. The system heats the CO_2 gas to approximately 560 - 675°C, injects oxygen into the CO_2, takes the gas through a platinum catalyst at high temperature, during which the hydrocarbons are converted to CO_2 and H_2O. Heat recovery is an integral part of the process. In many cases, additional heat is not required after start-up.

Aftercooling - uses shell and tube exchangers to remove as much water as possible prior to dehydration.

Adsorption - in this process several different contaminants may be removed using adsorptive materials such as plain carbon, coated carbon, zinc oxide and others. The contaminants removed include hydrogen sulphide, mercaptans, mercury, aromatic hydrocarbons such as acetaldehyde and amyl alcohol, etc.

Drying - CO_2 is typically dried to minus 60°C dew point (10.5 ppm by volume of water). Drying systems are normally controlled by moisture content of the leaving CO_2 or may be on a timed cycle.

Condensing - CO_2 condensing is normally accomplished in the region of 18 to 21 BarA at minus 28 to minus 40°C, depending of the client's preference and the system requirements.

Distillation - liquid CO_2 from the condenser is processed in this unit to remove air, methane, hydrogen and other low boiling point elements to provide a minimum CO_2 purity of 99.95%.

Subcooling - this stage cools the liquid CO_2 stream below the associated saturation pressure prior to entering storage. This cooling lowers both tank and transport vent losses.

Storage and loading - liquid CO_2 is usually stored in a carbon steel 'bullet' type tank with a minimum of two tanks per plant. The total minimum capacity is three days plant production (100 tonne per day plant would use two 150 tonne storage tanks minimum). Loading of the trucks typically requires 30 minutes to an hour for a 20 tonne tank truck.

Refrigeration - the refrigerant of choice in the majority of plants is ammonia, which is very efficient, readily available, low cost,

self-alarming, etc.

After going through this system the liquid CO_2 is ready for use.

Uses of carbon dioxide

In addition to the classic uses of carbon dioxide in the carbonated beverage and brewing industries, there are numerous uses for CO_2 in a varied cross section of industry.

Fresh meat processing and shipping

When processing meat, one of the most important considerations is its temperature.

Carbon dioxide systems solve these problems, easily and economically. Injected as a liquid, carbon dioxide forms a fine snow that can keep a product at a controlled temperature.

Frozen food transportation

Chilling provided by dry ice or pellets make this a highly effective means of holding low temperatures in the storage and shipment of ice cream, frozen foods and other perishables.

Spiral and tunnel freezers

CO_2 freezing employs the direct contact of snow-like CO_2 at -78.5°C. CO_2 snow is a result of flashing liquid CO_2 through an orifice or nozzle. As the liquid CO_2 is flashed, approximately 50% becomes snow with the other 50% being vapour. About 85% of the cooling value is contained in the snow. Carbon dioxide freezing systems preserve products in a close-to-fresh condition by faster freezing.

Oil and gas production

Liquid carbon dioxide is injected into oil and gas wells simultaneously with other treating fluids to obtain better well potentials than are obtained from other stimulation techniques. This promotes faster clean up of wells, generally without needing to swab. When pressure is released at the well head after treatment, the CO_2 vaporised by heat transfer from the formation expands, imparting a gas lift so that normal reservoir drive can then unload the fluids from the well. Improved clean up and substantial removal of stimulation fluids reduces or eliminates formation damage that restricts the realisation of maximum possible flow potential.

Dry ice is used in the oil and gas industry to quick freeze formation cores to ensure retention of entrained fluids for laboratory analysis.

Other usage includes addition to stock tanks of oil to create a turbulent action that allows better mixing of emulsion breakers. It is also used to freeze liquid in line pipe, tubing, drill pipe, etc, forming temporary pressure resistant plugs that allow replacement of faulty valves or addition of other needed equipment.

Oil and gas refining and pipeline

Inerting or purging with carbon dioxide or dry ice is often necessary to avoid the formation of potentially explosive mixtures when starting up, shutting down or repairing piping, barges, tanks and other enclosed equipment containing combustible gases or fluids. If this equipment entraps air, it will at some stage of the operation contain a mixture of air and gas that can have a high explosive potential.

Inerting or purging can also prevent the deterioration of a product that reacts with normal atmospheric moisture by surrounding it with a dry, non-reactive atmosphere.

Supercritical gas extraction

Carbon dioxide is an excellent vehicle for extractions of many kinds. A considerable number of patents have been issued in this area, including coffee, hops, and many other food and chemical products.

Other uses

Other uses of carbon dioxide are: fire protection, hardening of sand core and moulds, grinding of heat sensitive materials, water treatment, low temperature testing, shrink fitting, aerosol packaging, deflashing moulded rubber and plastic parts, enrichment of greenhouse atmospheres, fresh fruit and vegetable shipment, uranium solution mining, welding, grain storage fumigant, urea manufacturing and, when mixed with oxygen, as a respiratory stimulant.

Contact Wayne Youngs at Toromont Process Systems,
tel: 01622 754051,
fax: 01622 676891.

Norsk to use CO_2 separated from gas to enhance oil recovery

Norway's Norsk Hydro is considering the use of a process concept borrowed from the ammonia industry to produce electricity from gas while emitting only steam and air, according to the IEA Greenhouse Gas R&D Programme's newsletter *Greenhouse Issues*. Norsk is to separate hydrogen from natural gas for use in power generation, with the carbon dioxide produced being used to enhance oil recovery in the offshore Grane field.

Combined cycle power plants with an annual capacity of 10-12 MWh would burn the hydrogen fuel and produce power for sale. The concept was identified as a result of cooperation between several different parts of the energy, chemicals and metals company in search of greener methods of electricity production.

The hydrogen would be produced by steam reforming, the same process as that used in Norsk Hydro's ammonia plants. Methane, the main ingredient of natural gas is reacted with steam at a temperature of around 900°C, releasing hydrogen. At the same time, the carbon in the methane is oxidised to carbon dioxide. Hydrogen and carbon dioxide are separated into highly concentrated streams by techniques which are already in use in ammonia plants. After drying, the CO_2 is ready for use.

Hydrogen from the reformer will be burnt in gas turbines in a combined cycle power station, with a steam-turbine bottoming cycle to make the best use of the heat available from combustion. Emissions from this plant, the technology for which is currently under development, will be steam, air and a little NOx.

Two plants will be built at onshore locations on the west coast of Norway.

Dear Louise Evans
Energy Education - Into the Learning Age
I am writing to thank you for the above article in the current issue of Energy World; we do not often see major statements written by members of the staff, and I hope that we shall see plenty more of similar significance.

I am sure that papers such as this are of far more interest to the membership as a whole, than are rather superficial surveys of various technical subjects which make up the bulk of Energy World. You have told us where the Institute stands on education and what it aims to do - and I do hope these aims can be achieved.

Might I suggest another policy matter on which an author statement should be made? In the July/August and October 1997 issues of Energy World there were brief announcements concerning the admission of 'energy management professionals' to the AMInstE grade. I believe that some of the old engineers among the membership may see this as a dilution of the calibre of the Institute by admitting non-engineers. I know that it is policy to broaden the scope of the Institute so that it covers all aspects of the wide field of energy, so that is becomes THE Institute for energy matters. I would suggest that an alternative statement on the future plans for the Institute to mark out its place on energy matters would be a useful article for Energy World; go into the subject in depth, spelling out the Institute determination to take (or regain) a leading position on energy - you could write it or Diane or perhaps it should come from the President himself - not just a quarter page statement, but a major flag-waving exercise.

Your sincerely
Bill Tipler

Dear Mrs. Fisher,

I recently read an article in the July/August edition of Energy World stating that it is possible for me to obtain Chartered Engineer status by topping up my BSc(Hons) in Energy Engineering with the Open University's new MEng. degree. Could you please provide me more information on the modules that will be appropriate?

Yours faithfully,

Simon Higgens.
Graduate Member.

Tracey Fisher replies:

The article that was written by Tony Pearce of the Open University in the July/August issue of Energy World, indicated that candidates can now achieve Chartered Engineer status (through the individual case procedure route) by studying the new 480 point MEng. degree programme or by using it to top up previous relevant study. The statement was not strictly true as the degree programme has not yet been approved for registration purposes with the Engineering Council. A task group has been established by the Registration Standards Committee of the Engineering Council, comprising representatives from the engineering institutions, to evaluate the structure of the Open University's MEng. programme. The review is currently ongoing and, as such, no decision as to whether or not the programme will be acceptable for Chartered Engineer registration or which particular modules will be required has been reached. Readers will, however, be kept informed of any decisions in future issues of Energy World.

Louise Evans replies
Energy education into the Learning Age
Thank you for your letter of appreciation regarding the above article that I wrote for the July/August '98 edition of Energy World. I am pleased that it met with your approval, and I have passed your other suggestion for an article to Tracey Fisher, Membership and Education Manager, to consider.
As you reflect, although not everyone will agree with every action of staff or committees ultimately we are all trying to make the Institute as successful as it can be. To do this the staff must work with committees and consult and listen to the wider membership. In return the membership must put their trust into the staff and committees to drive the organisation forward.
Thank you once again for your valued observations.
Yours sincerely
Louise Evans

FEEDBACK FROM MEMBERS

In the April issue, you were asked whether a charge of £10.00 should be introduced to members wishing to receive the Journal. Currently, only Associates pay this additional charge. The result of feedback from members, was overwhelmingly in favour of the charge. You also voiced your thoughts on the production of a Members' List with the majority not in favour of the list.
Therefore a Members' List will not be published.
The Institute would like to thank all of those who gave us their comments.

New Members

East Midlands

Mr J Buxton MInstE
Stockport Metropolitan Borough Council

Mr M D Dickens, AMInstE
ENTECH Energy Consultants Ltd

London & Home Counties

Aon Group, Group Affiliate

South Wales & West of England

Mr AP Moss, Associate
RAF St Athan

USA

Mr B R Bogner, MInstE
Amoco Chemicals

New Faces at the Institute

If you haven't been in contact with the Institute recently, you may not be aware that there are two new members of staff:

Beatriz Cano is a new addition to the Membership and Education department. She has replaced Louise Golds who has sadly left the Institute for pastures new. You will know when you are talking to Beatriz if you telephone the department, by the accent - she is from Spain!

Sam Cobbina joined the Finance department earlier this year. He is the person who is responsible for all of the money that comes in to the Institute, so beware if those subs are not paid on time!

A nuclear future? Is it your special interest?

The Executive of The Institute of Energy has given approval for the establishment of a Nuclear Power Special Interest Group. Its objectives are contained in its Mission Statement:

"The Group will provide a forum for members of The Institute of Energy to interchange accurate and balanced information on all aspects of the current and future use of nuclear power for electricity and heat generation, with particular reference to the United Kingdom."

The Special Interest Group will work with other learned societies and institutions with similar interests.

Although the Institute of Energy is deeply involved with the extraction and use of carbon-based fuels, nuclear power, producing over 25% of the electricity used in the United Kingdom and 35% in the EC, involves a significant proportion of members. Fuel and power continues to be an evolving field of technical activity and a Renewables Energy Group is being established in Scotland to complete the coverage of power sources.

Oil, coal and natural gas will continue to dominate some sectors of energy use for the next one or two decades, but it is necessary to consider a number of options. Further controls on carbon based fuels are likely to emerge as evidence accumulates that their emissions are contributing to global warming. The Special Interest Group believes that the achievements and the many beneficial aspects of nuclear power need to be explained to the widest possible audience. A series of discussion sessions are being planned at branch level, preceded by a short presentation, to provide members with the opportunity to air their views.

Peter Johnson is the chairman of the group and Paul Spare the secretary.

Members who wish to join or express an interest are asked to contact Paul Spare on tel/fax: 01606 49069

Branch Events

October 1998

South Wales & West of England

Tuesday 6 October, 11.30am
Joint meeting with Combustion Engineering Association - visit to Tyseley Waste Incinerator, Birmingham. Contact Dr I Weslake Hill, tel: 01222 757527

London & Home Counties

Thursday 15 October, 6.00pm (following branch committee meeting)
Talk on Micro CHP Schemes by Alfred El Kearsey at The Institution of Gas Engineers. Contact Mr PM Johnson, tel: 01793 893330

South Wales & West of England

Thursday 15 October, 6.00pm
Lecture on Refrigeration at University of Wales, Newport Rd, Cardiff. C Jessop of March Consultants Ltd. Contact Dr I Weslake Hill, tel: 01222 757527

Northern Ireland

Tuesday 20 October, 6.00pm
University of Ulster Jordanstown
Joint paper with Pipeline Industries Guild on introduction of gas and CHP. Contact Dr P Waterfield, tel: 01232 364090 email: p.waterfield@ulst.ac.uk

Scottish

Tuesday, 27 October & Wednesday, 28 October, 8.30am (allow full day)
One day tour of Longannet Colliery includes visit to mine face. Please note limited places available. Contact Mr C Boyd, tel: 0141 270 7060

South Coast

Tuesday 27 October
Evening visit to Aerlaminates, Totton. Contact Mr G Orme tel: 01703 319320

November 1998

Northern Ireland

Tuesday 3 November, (time to be confirmed)
University of Ulster Jordanstown. Address from the new Chief Executive, Diane Davy. Committee Meeting and Student Meeting.
Contact Dr P Waterfield, tel: 01232 364090 email: p.waterfield@ulst.ac.uk

Irish celebrations!

Des Speed (NIE), Paul Burns (Sx3), Chris Roulston, Barry Carty, Louise Collins (IoE), John Murry, Colum Fegan, Patrick Gribben, Stewart Pike, David McCartney, David Black, Andy Lindsay (Sx3), Cathal Morrison, Ronnie Moore (Sx3), Shane Murphy (Sx3).

The Energy Awards Ceremony was an overwhelming success. Over 200 people gathered at Belfast City Hall to see Immediate Past-President John Chesshire award NVQ certificates to those who took part in the NVQ pilot programme. A host of young Northern Ireland Electricity apprentices were also present to receive their certificates for taking part in the piloting of Green Alert! which will shortly be available as energy and environmental awareness training material for young workers.

Guests delighted in the tales of those who took part and gave appreciation to the sponsors; Northern Ireland Electricity, the Training and Employment Agency and the funding source for Green Alert! - The Leonardo da Vinci programme.

The Institute would like to thank all those who took part, the sponsors and the Northern Ireland branch for their ongoing support. The NVQ in Managing Energy is now available at the satellite site in Northern Ireland, SX3, training division of Northern Ireland Electricity.

Our own Louise Collins managed both projects and her efforts were warmly rewarded by the Irish hospitality! All in all two very successful projects for the Institute celebrated in style! ***Contact Louise on lcollins@ioe.org.uk tel: 0171 580 7124.***

Trevor Floyd (IoE Internal Verifier), Pauline Mackey, David Bell (Assessor), Charles Nicell, Robert Stuart, Alan Murphy, Maria Adams (IoE), George Dougherty, Louise Collins (IoE), Peter Kernohon, John Hill, William Nutley, Andy McCrea (Assessor), Robin Davey (Assessor), Martin Fry (IoE Internal Verifier), Ken Hall, John Mawhinney.

South Wales and West of England branch report

The South Wales and West of England Branch of the Institute covers a large geographical area with a wide variety of energy intensive industries within its borders; coal and steel production, traditional industries in South Wales, power generation at Aberthaw, Berkely and Oldbury and china clay production at St Austell to name but a few. With the recent EU-sponsored re-development of the South Wales industrial areas, a variety of new industries are also represented. This all augers well for a dynamic and active branch.

However, even the most casual observer of the Institute regions would recognise the geography and demography of the Branch are less than ideal in attracting members from the whole branch to meetings at specific venues.

When one also considers the river Severn as a natural barrier keeping the natives of Wales and England apart, the challenge of developing Branch events of universal appeal is clear. As post-industrial change continues to accelerate in the UK, many aspects of life transform including work patterns, employment, retirement, travel, etc. Like our Institute, the South Wales and West of England Branch is trying to adapt its role to meet these various challenges.

As ever, we rely on a stalwart few to administer the Branch, and to show an active interest by attending events. As a committee, we continue to address the geographical and demographical needs of our Branch.

Established Branch Members will have noticed the coming season has retained our flagship events, the Idris Jones Lecture, the CRE Annual Luncheon and the Young Persons' Technical Paper Evening, but has cut back somewhat on the less well supported evening technical presentations. For the second year running, and to defend the Paddy Donavon Memorial Trophy won by the Branch last year, we are running a quiz night at Harry Ramsden's in Cardiff in conjunction with The Gas Association of Wales and The Institution of Gas Engineers.

Innovations being considered by the Committee this year include a video linked technical debate based at the universities of Cardiff, Swansea, Bath, Bristol and Exeter hereby reducing travel for Branch Members, and an informal lunchtime event to encourage out our large cadre of retired members.

We would like to invite all IoE members to attend SW&WEB events and direct you to the events calendar elsewhere in this organ for details. Finally, we would like to thank all those who contribute to the success of the Branch and the Institute .... they know who they are!

Tal Golesworthy,
Branch Chairman

Ian Weslake-Hill,
Branch Secretary

Membership in the Millennium

Time is ticking away!

With the last issue of Energy World we launched the Membership in the Millennium campaign to recruit new members and build the Institute for a strong future. To be a success, this campaign needs the support of every member of the Institute. If each of you introduced a fellow professional into your Institute, you would double the strength and voice of your organisation immediately!!

Inside was a supplement:-

'THE PEOPLE AND THE PROFESSION'

With articles from Prof John Chesshire, Chairman of the Executive Committee, and our current President Mark Baker CBE, together with the latest news from the Institute and a 'request for an application form'.

If you need more of these supplements to give to potential members, please call us immediately on 0171 580 0077. Don't leave it to others, its up to you!

ENERGY IS THE FUTURE:

- We DO represent scientists, technologists, energy managers, lawyers, economists and engineers
- We ARE the only professional body for the energy and environment field that understands and demonstrates how important it is to bring these experts together.
- We DO have a voice in Government, Trades Unions and the Engineering Profession.
- We DO provide a platform to balance the views of pressure groups and Industry
- We DO get results from our work, and we do take the lead from our members and LISTEN.
- We RECOGNISE that YOU are the only people who can build your organisation to be what you want it to be.

It could be you!

IT COULDN'T BE EASIER....SIMPLY...

1. Give the supplement to a fellow professional and ensure that they complete the **request for an application form** on the back page and send it to the Institute **before 31 October 1998.** Make sure that they put your name on the form so you will receive your free gift from the Institute!
2. Your colleague will receive a full application pack - please support him/her to complete the paperwork. A further advantage of taking action now is that applicants will receive up to £40 savings with a reduced application fee of £19.99!
3. Once your colleague has submitted their application please stay in touch to make sure they are progressing well. Hurrah! You and your colleague have made it and you now have another ally recognised within the profession - Congratulations to you both!

As the supporting member you will now be entered into a prize draw and could win a trip on a yacht, a balloon ride, tickets for two to dinner and a theatre show - the possibilities and the prizes are endless - we estimate your odds of winning at 1 in 10 - better odds than the lottery! And think again, because you can enter the draw for as many times as you successfully introduce new members to the Institute!