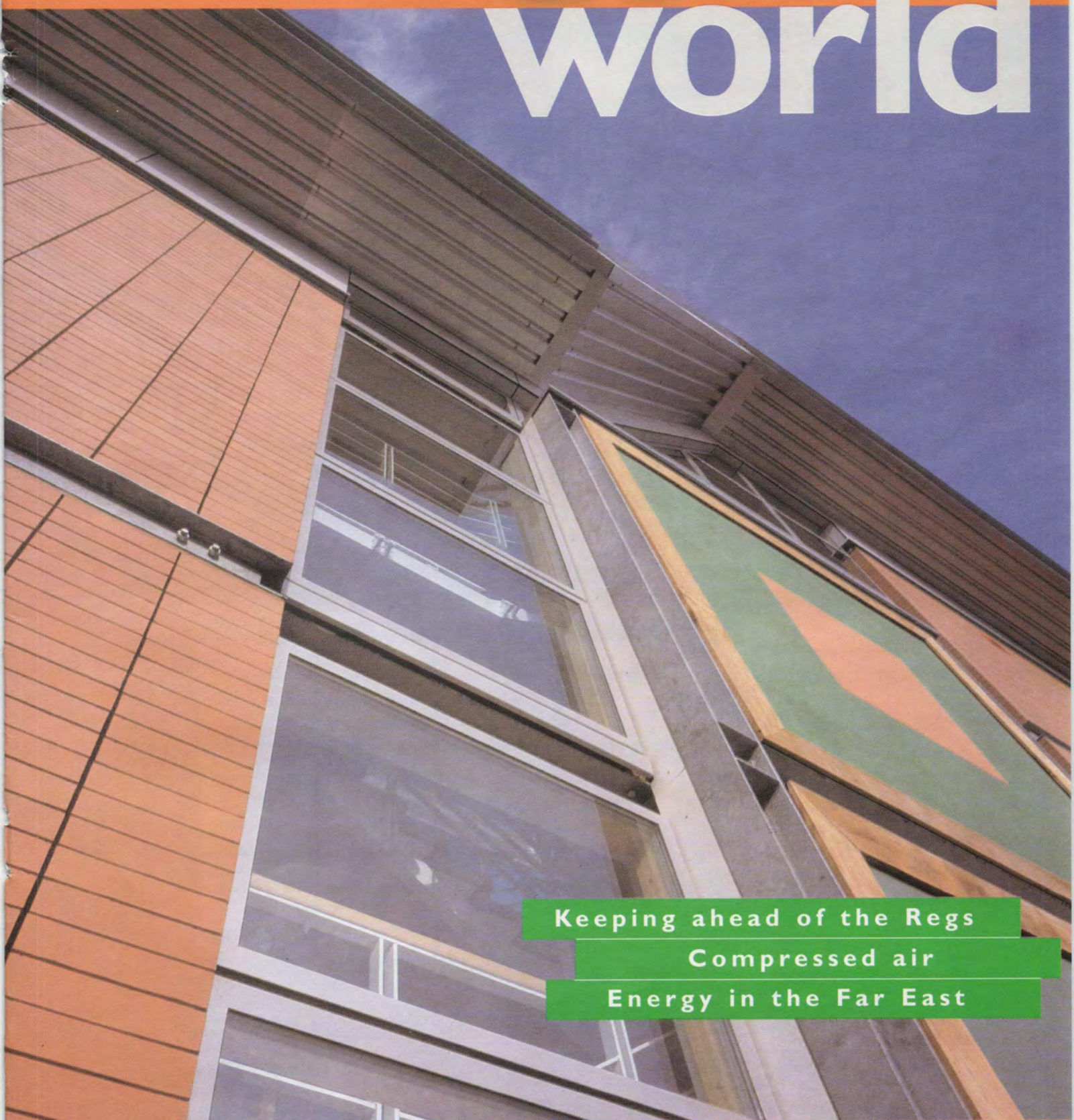
THE MAGAZINE OF THE INSTITUTE OF ENERGY

# energy world

the institute of energy

No.303
October 2002



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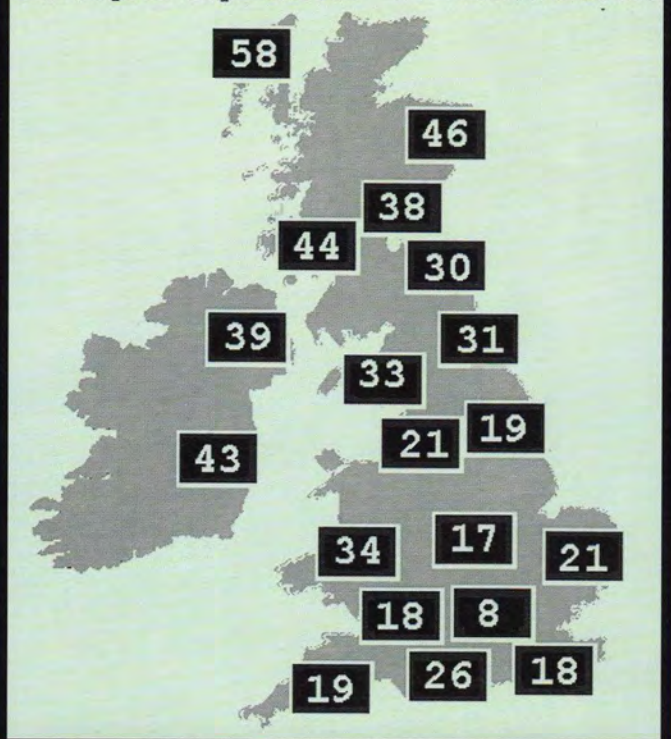


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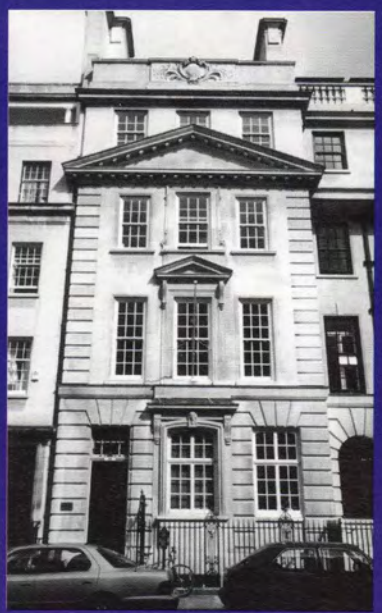

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# Professional Practice for Sustainable Development

## One Day Course, Tuesday 29th October 2002

**Sustainable development is not a fad.**
**There is an increasing need for employers to deliver sustainable development solutions that are technically, socially, economically and environmentally acceptable.**
**Professional Practice for Sustainable Development provides a means for doing just this.**

This one-day course is designed to enhance participants' understanding of sustainable development and helps put that learning into practice with the use of case studies from business and industry to illustrate how sustainable development principles are currently being applied.

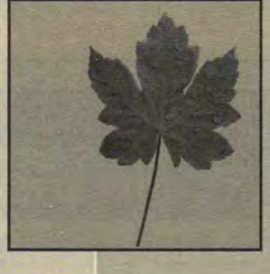
The key to this course is its flexible nature. When registering, delegates are encouraged to highlight their concerns and issues, and where possible these will also be discussed.

**Participants of this course will:**

- Improve their awareness of sustainable development principles and develop their understanding of some of the definitions of sustainable development and sustainability;
- Understand the implications and benefits of sustainable development for their work and business activities;
- Explore some of the ways in which sustainable development principles are currently being applied by businesses and organisations of all types;
- Increase their knowledge of sustainable development tools and techniques;
- Discuss sustainable development with delegates from other organisations - helping to challenge ideas and share good practice;
- Develop a personal action plan for implementation at work.

**PLUS participants will receive follow-up support from the course facilitator to assist and advise in applying these principles to their current role.**

This course will be held in London on 29th October 2002, and costs £100 for InstE Members and £150 for Non-Members.



**www.instenergy.org.uk**

## Programme - Professional Practice for Sustainable Development

| | |
|---|---|
| **09.30** | **Registration & Coffee** |
| **10.00** | **Welcome** |
| **10.15** | **Introduction to Sustainable Development**: What does Sustainable Development mean? |
| **11.45** | **Coffee** |
| **12.00** | **Spaceship Earth**: The importance of long-term planning. |
| **13.00** | **Lunch** |
| **13.30** | **Sustainable Development & Business**: Investigating applications of Sustainable Development principles in business and industry. |
| **14.30** | **Systems Thinking**: Investigating tools for applying Sustainable Development principles. |
| **15.45** | **Coffee** |
| **16.00** | **Summary**: Reflection on the day's activities and development of individual action plans. |
| **16.30** | **Close** |

## Registration form

Please complete one registration form per delegate. This form may be photocopied if necessary.

Please tick appropriate date/location:

☐ Member Rate: £100.00 ☐ Non-Member Rate: £150.00

Prof ☐ Dr ☐ Mr ☐ Mrs ☐ Ms ☐ First Name Surname

Organisation Job Title

Address Telephone

Fax

Postcode Email

☐ I enclose a cheque payment payable to 'The Institute of Energy'

☐ Please charge my credit card for the sum of: £_____ ☐ Please send me a receipt

Cardholders Name Card Number

Credit card payment (tick) ☐ Amex ☐ Visa ☐ Mastercard ☐ Diners Club ☐ Switch Issue Number (switch only)

Card Expiry date Card Issue Number Valid from

Signed Date

Please return your completed form with payment to:
Katie Moore, Institute of Energy, 18 Devonshire Street, London W1G 7AU
**Tel:** 020 7580 0008 **Fax:** 020 7580 4420 **Email:** events@instenergy.org.uk

**Terms and conditions**: Cancellations received in writing up to 10 working days prior to the date of the course will be subject to a 25% administration charge of the total remittance. No refunds will be made for cancellations received after this time or for non-attendance. However, we are happy to make substitutions at any time before the event. We are not able to confirm any bookings until after payment is received. The Institute of Energy reserves the right to alter the programme without prior notice.

**Registered Charity No: 205936**

October 2002 - Number 303

THE MAGAZINE OF THE INSTITUTE OF ENERGY

# Contents




## COVER

Energy used in buildings – one of the facades of the new Faculty of the Built Environment Studies Building at the University of the West of England. Engineer Buro Happold has incorporated straw bale technology in the external envelope of the building – to keep ahead of tightening Building Regulations. See the full story starting on page 8.

Architect: White Design
©BuroHappold/Adam Wilson

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# Do we have solar take-off?

*Rod Hacker, FInstE, Chairman of the British Photovoltaic Association*

**For the last 30 years** the proponents of solar photovoltaic power have been saying that the solar age will be here in the next decade or two. We have seen enormous growth in the last couple of years, so are we really at the take-off point? In my view this is the real start and by 2020 solar power will be providing a significant portion of electricity demand.

The world-wide market for photovoltaics (PV) has been growing at 25% plus for several years and last year reached 35% when nearly 400 MW of modules were produced. The annual value of the PV business is now about $3 billion, which has to be serious. Admittedly a large portion of the market is still supported by governments or the international development agencies. However, the major industry players are also investing heavily, particularly the oil and gas company subsidiaries and the major electronics firms, looking for long-term returns. National and international programmes are increasingly directed towards developing stable industries founded on secure markets, local manufacture and effective supply chains rather than one-off demonstrations of technology.

There are established markets for stand-alone power supplies where PV is now cost-competitive and which continue to grow, but there are also two big markets which have only just started to develop. The first is power for remote homes and communities in developing countries. There are billions of people with little hope of being reached by electricity networks for whom solar power is the best solution. The second is building-integrated PV (BIPV) on homes and other buildings in industrialised countries. Some 20% of all electrical power in Europe generated from building-integrated PV is a real possibility in 30 years time.

We have been a little slow in the UK to promote a strong national industry, despite having some very good businesses and research centres. The recent creation of the BIPV field trial programmes and now the Major PV Demonstration Programme together offer around £30 million to kick start the UK market over the period to 2005. These programmes will raise awareness and acceptance of PV in the UK whilst helping to integrate the PV industry and its products into the building industry. So far, there has not been a national effort to develop the export potential.

PV systems have a high capital cost but very low running costs, making it hard to compete when payback periods and cash flow rule the purchasing decisions. This is particularly so when our electricity trading and regulatory frameworks do not provide a fair market place for distributed renewable generators. The reduction of costs to make PV competitive with the alternatives is one real key to continued growth. In the BIPV market, cost reductions of up to one order of magnitude are required to make PV competitive – unless the playing field is levelled and environmental costs are brought into the balance. PV has achieved this much over the last two decades and the industry believes it can do it again with continued R&D and massive production scale-up.

But private homeowners do not buy PV just on economic analysis, they take a broader view of desirability. Can we not move away from simple economics and regard PV as regular feature of any building – just as we regard windows and roofs, without questioning the economics of each component?

The target for remote homes market is much easier, PV is already cheaper than many alternative forms of energy for lighting and small power. Programmes to stimulate local production and supply chains together with consumer finance mechanisms are creating real markets.

Clearly, it will be years before sufficient cost reductions or changed attitudes can be achieved. We need to continue research into improved technologies and manufacturing, scale-up factories to ten times their current size and make the supply chain much cheaper through expansion, competition, and standardisation. Meanwhile, governments and agencies need to hold their nerve and continue support until true commercialisation of the industry is reachable. The timeframe and the scale of the task are both too great for industry alone to carry the development costs.

We have seen the devastating effect of stop/go support for other renewable industries in recent years. One of the declared objectives of the UK's major demonstration programme is to build the national industry through steady market growth and development of home grown products to replace the current high level of imports, so there is hope. It will be critical to the eventual success of the UK PV industry that support to the industry continues after 2005. Continuance of incentive schemes and the actions to tackle institutional and regulatory barriers should both be key features for the home market, along with export-orientated programmes. The forthcoming Energy White Paper is an opportunity to recognise and reinforce the prospects for solar power in the UK.

There is a dual challenge for solar take-off; to Government to ensure the conditions are right and sufficient funds are available, to industry to make it happen. We cannot afford to pass up on the opportunity to develop a significant portion of our future energy supplies from clean, silent, reliable and free at source solar power.

***Contact PV-UK at: www.pv-uk.org.uk***

# The end for four star lead replacement petrol

**The age of leaded** '4 star' petrol, and its lead-free 'lead replacement' petrol (LRP) will gradually draw to a close over the next year, as LRP is withdrawn from filling stations across the country, particularly those where demand has rapidly diminished.

However, owners of cars that require this type of fuel will still be able to continue using them by switching to Super Unleaded 97 RON or Premium Unleaded 95 RON petrol as appropriate and, in both cases, using an additive at each fill-up.

The options are explained in detail in a briefing paper from the UK Petroleum Industry Association (UKPIA): *Alternatives to LRP* available on its website. A leaflet will also be available shortly on the Department for Transport website.

The UKPIA says that, as many pre-1991 cars become uneconomic to repair and are scrapped, customer demand for LRP has declined rapidly to the point where it is no longer a viable grade for practical and technical reasons.

With the EU-wide move to cleaner fuels and cars, the general sale of leaded 4 star petrol was banned from 1st January 2000 and lead replacement petrol (LRP) was introduced in its place. The move to unleaded petrol and exhaust catalysts has made an important contribution to improved air quality in the UK. According to the UKPIA, around 50 present day cars produce the equivalent exhaust emissions of one 1970s vehicle. ***See further guidance at www.ukpia.com and www.dft.government.uk***

# Carbon Trust expands ECA technology list

**The Carbon Trust** has taken over the management of the Enhanced Capital Allowance (ECA) scheme on behalf of the Department for Environment, Food & Rural Affairs (DEFRA).

To coincide with this, the list of qualifying energy technologies has been expanded; from boilers, pipe insulation, thermal screens, CHP, lighting, motors, variable speed drives and refrigeration equipment; to include heat pumps for space heating, warm air and radiant heaters, solar thermal systems, and compressed air equipment. Existing technology classes for boilers and refrigeration have also been expanded, to include efficient oil-fired condensing boilers and refrigeration cabinets and compressors.

The Energy Technology List details the range of energy-saving products and technologies that can qualify for 100% first year allowances under the ECA scheme.

CARBON TRUST

**Making business sense of climate change**

The Trust has also launched a marketing programme to help manufacturers, suppliers and purchasers promote and identify qualifying equipment. ***For further information on the ECA Scheme, please call the helpline on 0800 58 57 94, or visit www.eca.government.uk The Carbon Trust's first annual review, for 2001-02, is now available. Visit www.thecarbontrust.co.uk***

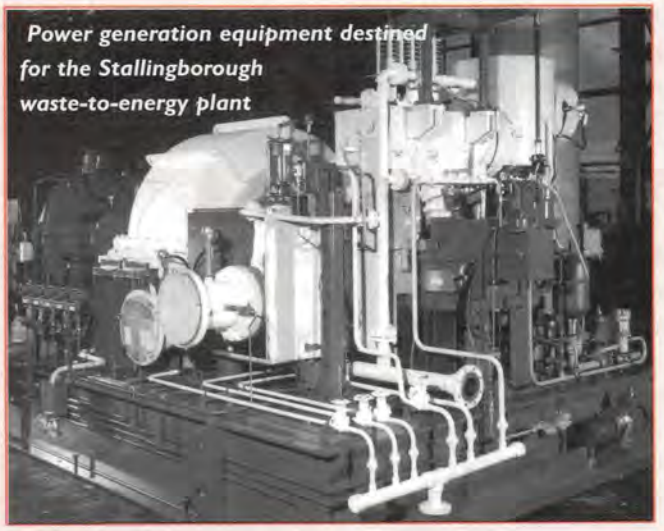
# Energy from waste powers chemical company

**Electricity generated** by a new waste-to-energy plant being built at Stallingborough, near Grimsby, is to power a local chemical company.

Peter Brotherhood Limited has secured a contract worth over £1 million to supply the power generator for the plant being built to convert municipal waste into electrical power. The company is supplying an alternator set driven by a condensing steam turbine.

The plant will process 56,000 tonnes of mixed municipal waste, from homes and businesses in North East Lincolnshire, each year. The waste will be converted into fuel for combustion in the plant. The £8.5 million development will produce 3.45 MW of power which will be used to supply the adjacent chemical company.

Peter Brotherhood manufacturers turbo alternator sets which range from 500 kW to 30 MW, specialising in supplying machines for renewable and sustainable applications. The company supplied a 4 MW turbo alternator set for a waste treatment plant at Neath, South Wales earlier this year and has supplied similar machines for waste to energy plants throughout Europe.



*Power generation equipment destined for the Stallingborough waste-to-energy plant*

# Five new North Sea developments

**A flush of** new developments in the North Sea has boosted the Government's faith in its efforts to bring new operators into the sector and ensure that fallow fields are in the right hands.

The five North Sea developments include:

- start-up of the Halley oil field operated by Talisman in the Central North Sea;
- start-up of Brigantine C and D fields operated by Shell in the Southern North Sea;
- DTI go-ahead for the Helvellyn Field operated by ATP in the Southern North Sea;
- discovery of hydrocarbons in the 'Barbara' prospect operated by Dana, following test drilling; and
- discovery of a mix of oil and gas from the Black Horse test well, operated by the same company, EnCana, that recently reviewed forecasts for the Buzzard discovery, with a billion barrels of oil in place.

Welcoming the developments, Energy Minister Brian Wilson said that they "confirm that we now have small, innovative companies eager to exploit the UK's hydrocarbon resources with new technology. It is fascinating that fields which were licensed as long ago as 1984 and even, in the case of Helvellyn, in 1964 are now being developed through a combination of enterprising operators and modern technology.

"The massive Buzzard discovery has shown that very large new finds in the North Sea are possible," said Wilson, "but, in terms of employment and economic returns, it is equally important to have a wide range of smaller developments coming onstream and that is why this recent activity is so welcome."

***Before flying out to join the World Summit on Sustainable Development in Johannesburg, Prime Minister Tony Blair took on a spot of cavity wall insulation work back at home. Blair helped to fit insulation into the cavities of the home of Mrs Joan Harrison of Chilton, Ferryhill, County Durham, the five millionth British home to have its cavity walls filled, according to the industry.***

***Blair was assisting the work of local insulation installer Heatpac Middlesbrough Insulation Co, blowing 5 m³ of Crown Supafil insulation supplied by KnaufAlcopor. The work was paid for by the Government's Warm Front scheme (formerly the Home Energy Efficiency Scheme) which, since 1991, has funded grants to families with children, people who are disabled and the over 60s - all of whom must be in receipt of certain benefits to qualify.***

# FGD for Cottam

**The Government** has granted consent for the construction of flue gas desulphurisation (FGD) plant to serve two of the 500 MW units at the 2000 MW, coal-fired Cottam Power Station, Nottinghamshire.

The new plant will have a dual role, removing 90% of the sulphur dioxide from the combustion gases produced by the power station and producing gypsum (calcium sulphate), which is heavily used in the building trade as a by-product. The plant will also extend the life of the power station by approximately fifteen years, safeguarding existing jobs.

Cottam is owned by the London Power Company (LPC), the generation subsidiary of the LE Group, formerly London Electricity. The project is likely to cost up to £70 million, with work on-site beginning towards the end of this year or early in 2003. FGD plant is already under construction at LPC's West Burton power station, also in north Nottinghamshire.

# Nuclear decommissioning at Berkeley, Windscale

**BNFL** Environmental Services has begun work on the six-month contract to remove the cooling water structures in the Severn Estuary, at Berkeley power station, Gloucestershire. The demolition of the intake concrete structure is being carried out at low tide using four 40-tonne escalators fitted with specialist concrete breakers. The steel piling of the baffle wall will be removed using specialist gas cutting equipment from an enclosed cradle suspended from the top of the m high wall.

The challenging project, 50m out into the River Severn, is made even more difficult by one of the largest tidal ranges in the world. The programme of remediation, overseen by the Gloucester Harbour Trustees, has had to be synchronised with these tides.

Once the steel piling from the wall has been removed for recycling, the cooling water tunnels running from the baffle wall and onto site will then be backfilled, and the associated land area restored to 'greenfield' status.

Berkeley was the first commercial nuclear power station in the UK to commence decommissioning, and continues to lead the way in this field. The station had twin Magnox reactors, with a combined output of 276 MWe, and heat exchangers that were external to the reactor building, providing a unique decommissioning challenge. The station was closed in 1989 after 27 years of operation.

# Energy policy is 'unrealistic', says Academy

**The Government's** energy policy is hopelessly unrealistic, expecting far too much from renewable energy sources and ignoring serious concerns about reliable gas supplies, the Royal Academy of Engineering has told Energy Minister Brian Wilson MP in a new report. The Academy's engineering assessment is highly critical of the Energy Review published by the Cabinet Office Performance and Innovation Unit in February (see *Energy World* April 2002).

The Academy's most immediate concern is about security of gas supplies, which the Energy Review assumes will continue to be plentiful and relatively cheap. However, the DTI's own figures indicate that, by 2020, the UK might need to import up to 90% of its gas requirements. We could experience gas shortages as soon as 2004/5 in a severe winter. While Russia is expected to double its gas exports to the EU by 2010 the Government must address the planning, funding and operational questions involved in expanding the pan-European gas transmission network so that we can access imported gas. We will also need to build new storage facilities as we become a gas importer. The Academy estimates this could cost the Government up to £13 billion by 2020, as the market is not likely to bear the cost.

The Energy Review also sets a target of generating 20% of our energy from renewable sources by 2020. While this is a laudable aim it is over-optimistic and fails to address the fundamental problem with all renewable sources – that they are intermittent, says the Academy. "Experience on the Continent, especially in Denmark, has shown that grid stability can be adversely affected when the penetration of intermittent renewables reaches about 15%," says the Academy's report. As yet, the UK electricity grid is isolated, except for one interconnector to France - further interconnectors to Norway and the Netherlands are being investigated to help share electricity. As more renewable sources are connected to the grid, electricity storage will become essential - our only current storage capacity is through hydroelectric storage schemes.

*The Academy's most immediate concern is about security of gas supplies*

The Energy Review places great faith in wind energy and proposes installing 22,000 MW of turbine capacity by 2020. However, Met Office data shows that the country's wind record is not dependable - the most likely power output in real life is less than 7,000 MW. To ensure the supply it would have to be backed up by 16-19,000 MW of conventional generation plant, adding an extra £1 billion to the cost. Biomass is another promising power source for the future but it needs more research to make it practical - the whole of Kent would have to be covered in coppiced willow to replace the output of Dungeness B nuclear power station.

In order to meet our commitments to reduce carbon dioxide emissions we must replace the nuclear reactors coming to the end of their lives with non-carbon emitting energy sources, says the Academy. The Energy Review conceded that the nuclear option should be kept open in case we cannot find alternative sources. But it takes so long to build new power stations that we need to commission them in the next few years if they are to be on stream in time to prevent supply shortages.

The Academy is also very concerned about the Government's lack of attention to transport issues - 42% of UK energy consumption goes on transport. Major support for research to develop the hydrogen economy is urgently needed. "The Energy Review appears to accept fuel switching, probably to hydrogen, as inevitable in the long term," says the Academy's report. "But it is unwilling to recommend early action or signal that this is the Government's preferred solution. Sustainable mobility is fast becoming a key political issue."

# Eight PV projects win Government support

**Eight solar** power projects, which represent 350 kW of generating capacity, have each won a share of a £1.32 million Government grant and are the first to be approved under the DTI's £20 million Major Photovoltaic (PV) Demonstration programme. Projects include:

- Ford's Centre for Engineering and Manufacturing Excellence at Dagenham;
- Peabody's roof refurbishment on social housing block in North London;
- the transport interchange at Vauxhall Cross in London; and
- a primary school in Wales.

Other projects are a housing refurbishment project in Leicester; an elderly care home in Carmarthenshire, Wales; a Catholic college in Sussex; and a second Peabody housing project in London.

Energy Minister Brian Wilson said "Solar power is turning into a real energy source for the UK. These eight new projects add to the hundreds of solar houses and buildings which the Government has already helped get off the ground. There is now a whole range of buildings, from leisure centres and schools to business parks and modern flats which have the new high tech photovoltaic roofs. It is now crucial that British manufacturers of solar equipment start to build a supply chain for the growing solar market. I want to ensure that the UK revolution in renewable energy brings with it UK jobs."

# US increases ethanol production

**The US ethanol** industry saw record production in June – up 13% from June 2001 – and lots of new manufacturing capacity is coming online. In the past few weeks, the Renewable Fuels Association (RFA) has announced the completion of two major ethanol plant expansions and one new plant, totalling 67 million gallons per year in new production capacity. The new, farmer-owned Adkins Energy plant in Illinois has the capacity to produce 40 million gallons of ethanol per year and includes a cogeneration facility to produce steam and electricity for the plant.

Manufactured from corn, ethanol is sold as a high-octane automotive fuel that reduces emissions. Its use reduces foreign oil imports, creates jobs and provides value-added markets to bolster agriculture and rural America, says the RFA.

Meanwhile, a new study by the US Department of Agriculture suggests that ethanol produces 34% more energy than is used in growing and harvesting the corn and distilling it into ethanol. Going against previous claims, the report concludes that the net energy value of corn ethanol has become positive in recent years due to technological advances in ethanol conversion and increased efficiency in farm production.

# Australian Government backs kilometre-tall solar tower

**An unusual** proposal to generate power from the sun on a grand scale has gained the backing of the Australian Government. Australia's Minister for Industry, Tourism, and Resources granted 'Major Project Facilitation' status to a proposal to build a 1 km high solar tower outside Mildura in New South Wales.

The tower, which would be the world's tallest man-made structure, will be surrounded by a transparent solar collector measuring 7 km in diameter. Convection forces will cause the hot air under the collector to be drawn up the tower, creating a draught strong enough to power a several air turbines, generating a total of 200 MW of electricity.

The Government's Major Project Facilitation status will result in a streamlined decision-making process for required government approvals.

The project's champion, EnviroMission Limited, estimates the cost of the solar tower, at more than $400 million, and intends to eventually build five towers across the continent of Australia by 2010. The company estimates that the first project would create 2700 jobs in its construction phase and 50 jobs once built. It hopes to start early next year with power generation starting in the summer of 2005.

The project would be an extension of a previous project constructed in Manzaneras, Spain, by the German firm of Schlaich Bergermann and Partners (SBP). That project, then called a Solar Chimney, used a 194 m tower to generate up to 50 kW of electricity. It operated from 1989 to 1996.

# Four new nuclear plants for Korea; managing the legacy from the FSU

**Four new** nuclear power plants to be built in the Republic of Korea are to benefit from components, instrumentation, control equipment and technical and engineering support services supplied by Westinghouse Electric Company, a subsidiary of the UK-based BNFL, under contracts valued in excess of £230 million.

The plants, with a total cumulative construction value in excess of £4 billion, are Korea Standard Nuclear Plant Plus design, based on the proven Westinghouse System 80 technology design.

The Shin-Kori 1 and 2 plants and the Shin-Wolsong 1 and 2 plants will be located in Pusan Metropolitan City and Kyungju-City respectively. Work will begin almost immediately and will run to 2009 for Shin-Kori and 2010 for Shin-Wolsong.

The Westinghouse contracts are with DOOSAN Heavy Industries and Construction Company Inc, and the Korea Power Engineering Company Inc. The plants will be owned and operated by the Korea Hydro & Nuclear Power Company (KHNP), a subsidiary of Korea Electric Power Corporation. As of the end of 2001, KHNP operated 16 nuclear power plants with an availability factor of 92%.

For Westinghouse, these contracts solidify the company's position as the leading supplier of new plant technology, said Jim Fici, Senior Vice President of Westinghouse Nuclear Plant Projects "Westinghouse supplied the first nuclear steam supply system to South Korea in the late 1970s. Since then, we have provided technology and equipment to 13 additional nuclear plants there, including three currently under construction," he said. The contracts will provide work at a number of Westinghouse locations in the US, including:

- Windsor, Connecticut – project management and engineering;
- Newington, New Hampshire – component manufacturing;
- Monroeville/Plum, Pennsylvania – engineering and equipment manufacture; and
- New Britain, Connecticut – equipment manufacture.

Meanwhile, three companies: BNFL, PE-International Consulting Ltd and RWE

# Large wind power for Texas, Idaho and California

**The US** wind energy scene continues to expand with two new projects, both of 200 MW or more in capacity, planned for Texas and Idaho, while smaller wind projects are underway in California.

In Texas, Cielo Wind Power, LLC plans to build a 240 MW wind farm south of Rankin in the western part of the state. TXU Energy has agreed to buy the power produced by the plant. Called the Noelke Hill Wind Ranch, the project will be the second largest in Texas (the nearby 278 MW King Mountain Clean Energy Center is the largest), and will be among the largest in the US. It will consist of 240 one-megawatt wind turbines manufactured by Mitsubishi and is scheduled to begin operating this autumn.

A project, announced in mid-July for Idaho, is in its early planning stages but would introduce the state to utility-scale wind power in a big way. Windland Inc hopes to build a 200 MW wind plant on Cotterel Mountain, southeast of Burley in south-central Idaho. The site covers land managed by the US Bureau of Land Management. Windland is still conducting technical and environmental evaluations of the site, but intends to begin construction in 2004.

Meanwhile, a new 10 MW wind plant is planned, and a 61.5 MW wind plant is near completion in California. The latter, the Whitewater Hill wind park in the San Gorgonio Pass near Palm Springs, will draw on forty-one 1.5 MW turbines.

# California to set greenhouse gas limits on vehicles

**The US State** of California has signed a bill into law that will set limits on greenhouse gas emissions from passenger vehicles sold in the state. Assembly Bill 1493 requires the California Air Resources Board (ARB) to develop greenhouse gas emissions standards for passenger vehicles, starting with model year 2009. The ARB has until the end of 2004 to develop and adopt regulations that "achieve the maximum feasible and cost-effective reduction of greenhouse gas emissions" from passenger vehicles. No specific reduction guidelines are included in the legislation.

Since greenhouse gas emissions are directly related to fuel efficiency, the new law will, in effect, set *de facto* mileage standards for vehicles sold in the state. Until the ARB develops its regulations though, it's impossible to judge the impact of the law. The standards will apply to car manufacturers' fleet averages, rather than individual vehicles, and car makers will be able to partially achieve the standards by reducing pollution from non-vehicular sources, including their own factories.

California has the unique ability to set vehicle emissions standards because the ARB existed prior to the Clean Air Act of 1970. That law allowed the ARB to continue to enact tougher vehicle emissions standards than federal law. Several other states are expected to follow California in enacting greenhouse gas emissions standards.

NUKEM Ltd, have been awarded contracts to manage UK assistance for the first in a portfolio of complex projects to help address the nuclear legacy in the former Soviet Union (FSU).

These projects include providing technical support to the UK Department of Trade and Industry's Nuclear Safety Programme (BNFL); the development of non-weapons related employment in closed nuclear cities and other social impact projects (PE-International Consulting Ltd); and management of spent nuclear fuel in Northwest Russia and dismantling an early generation nuclear submarine (both RWE NUKEM Ltd).

# Renewables could lead Thailand out of the 'Asian brown cloud'

**One third** of Thailand's electricity needs could be met with renewable energy by 2020, even if electricity consumption doubles, according to a report by Greenpeace, prepared in conjunction with the Sustainable Energy Network - Thailand.

The report: *Positive Energy Choices*, explains how working on a minimum 35% renewables mix, a quarter of the country's electricity could be derived from biomass, 5% from hydro and 2.5% from solar, with the remaining 2.5% divided between geothermal and wind. Between 2010 and 2015, renewable energy will become as cheap as conventional energy sources, possibly even cheaper, says Greenpeace. Under this scenario, greenhouse gas emissions would stay at roughly the same level.

The report, prepared for the World Summit on Sustainable Development being held in South Africa as *Energy World* went to press, follows reports of a massive haze of pollution over Asia. The 'Asian brown cloud', reported by the UN Environment Program to be 10 million square miles in extent and three km thick, is the result of forest fires and the burning of agricultural waste, as well as the increased use of millions of inefficient, wood-fuelled cookers. The cloud is reportedly blocking out up to 15% of sunlight locally.

The cloud was first identified in the 1980s and has now spread as far north as China and as far west as the Arabian sea. Described as a 'dynamic soup' of vehicle and industrial pollutants mixed with minute soot particles, the cloud seems to peak each January.

# Will the new Building Reg carbon dioxid

*by David Cheshire, Buro Happold*

***The latest revision to Part L of the Building Regulations does not in itself go nearly far enough when it comes to meeting the Government's carbon dioxide reduction targets and reducing the threat of climate change. However, the latest revision does set out the framework for future revisions to make a significant contribution towards making the difference. David Cheshire reports.***

**The latest revision** to Part L of the Building Regulations (Conservation of Fuel and Power) came into force in April this year. The aim of Part L is to improve the energy efficiency of all types of buildings, and so reduce carbon emissions. In fact, the Regulations form a crucial part of the Government's strategy to reduce greenhouse gas emissions to meet the targets they set following the Kyoto agreement (as set out below).

Previously, the Buildings Regulations aimed to improve the energy efficiency of new buildings by controlling the way buildings were designed. However, the Regulations did not include a way to check that the finished building matched the promise of the design intent. This, 2002 revision of the Regulations has been changed to affect not only the design, but also the construction and operational phases of a building's life.

***This page and opposite: Straw bale technology is incorporated into the external envelope of the new Faculty of the Built Environment Studies Building at the University of the West of England. Architect: White Design, engineer: Buro Happold.***
***© Buro Happold/Adam Wilson***

These changes mark the beginnings of a phased programme to progressively tighten the requirements of the Regulations to help to meet the Government's emissions targets. We will not see the full impact of this phased programme of future changes until five years from now, as the proposed changes are not going to be implemented until 2005 (or possibly later), by which time the Government should have implemented all the proposals in full.

One of the key problems with the 2002 revision is that the people who 'police' the Regulations, Building Control Officers, do not have the resources to check compliance on all these new areas for every building. This means that people will be asked to certify their own or each other's work, after passing tests and undergoing training that show they are 'competent persons'. There is no reason why this self-certification shouldn't eventually work, but there are currently a couple of problems. First, the Regulations are open to some interpretation and have flexibility built in to allow designers some freedom. This is going to mean that the least strict interpretation is going to be taken, wherever possible, and some of the original intent of the Regulations will, inevitably, be lost. Second, the competent persons scheme has not been set up yet, so Building Control Officers are having to handle all the work.

An industry wide consortium led by the Chartered Institution of Building Services Engineers (CIBSE) is attempting to get a 'competent persons' or 'self-certification' scheme off the ground to address this problem.

The UK Government has set a target for the reduction of carbon dioxide production to 20% below 1990 levels by 2010. This is beyond the commitments made in the Kyoto Protocol which set targets for a reduction in production of a basket of six greenhouse gases to 12.5% below the 1990 output by 2008-2012.

The Government estimates that the new Building Regulations can contribute to significant carbon savings by up to 1.32 MtC in 2010.

## Summary of the changes

The main changes to the Regulations are summarised in Table 1. Some of these represent the fundamental changes in scope that should contribute to our national targets to reduce $CO_2$ emissions from buildings. Part L has been split into two sections in this revision: Part L1 refers to dwellings and Part L2 is for non-domestic buildings.

These changes represent a significant increase in the cost of building. The Government estimates that the impact on cost could be up to £1400 per dwelling, or £7/m² for non-domestic buildings.

One of the suggestions of the lengthy consultation process undertaken for the new Regulations was that the proposed changes should be implemented in phases. This will give the building industry a chance to catch up with the new standards, but will mean that we are still producing excessive carbon dioxide emissions for some time. The full force of all the proposals will not be felt until 2005, or possibly even later.

The fundamental changes to the scope that will be used as a framework for future revisions are:

- there is more emphasis on regulating total energy use in the building, rather than just the heat lost and gained through the building fabric;
- standards of construction and commissioning are now being tested, rather than simply relying on the intentions of the designers to design

# ulations really reduce e emissions from buildings?

energy efficient buildings;

- the Regulations have been extended to include refurbishment and refits to existing buildings; and
- efficient operation of buildings is now being encouraged by metering where energy is being used and providing 'Building Log Books' which will include comparison between predicted and actual performance. Previously, the focus was on the design rather than the operation of buildings.

## The 'whole building' approach to design

Previously, the Regulations aimed to reduce heat loss (and gains) from the buildings by setting targets for each part of the building envelope (roof, walls, floor and glazing). This part of the Regulations has been tightened up, but there are also alternative approaches that regulate the amount of energy required to heat and cool a building – by looking at how the building is constructed and operated as a whole, rather than by looking at individual elements. This means that a non-domestic building with highly efficient heating and cooling equipment can be used as a way to compensate for a highly-glazed facade, for example.

Under Part L2 (non-domestic buildings), it is now possible to demonstrate that your building design will meet the standards by generating a computer (thermal) model of the building to predict its energy use. This method of compliance is likely to be used for innovative building designs that would not comply when using the conventional 'elemental' calculation.

Also, for the first time, over-heating in non-domestic buildings caused by solar gains through the windows is being limited. This is helping to reduce the size of cooling plant. This could result in buildings with less glazing, but is more likely to result in buildings with 'smart' facades, that can insulate the building against solar gain whilst allowing daylight to enter the building. These types of facades often have a third layer of glazing and/or shading outside to protect the interior spaces from the direct sunshine.

In the consultation process, it was proposed that the targets for insulation standards are progressively tightened, in future revisions, to the limit of what is technically feasible.

These new standards will mean that building services engineers and architects particularly, will have to work together to ensure that the air conditioning, heating and other services complement the building fabric. The flexibility to use thermal modelling and computer simulation to pass

***Table 1 Changes to Part L of the Building Regulations***

| | |
|---|---|
| **Parts L1 and L2**<br>The main changes to the Regulations that apply to all buildings are:<br>• higher standards of detailed design and site workmanship to ensure better thermal performance;<br>• increased standards of insulation;<br>• air-tightness standards to reduce leakage, including air pressure testing;<br>• requirements for commissioning;<br>• information about the operation of the building services to be made available to the operators; and<br>• an extension of the scope to include existing buildings. | **Part L1: dwellings:**<br>• improved targets for heat loss;<br>• a new 'Carbon Index';<br>• requirements for hot water systems and controls to be commissioned;<br>• operation and maintenance instructions to be provided; and<br>• performance standards for automatic controls for external and internal lighting efficiency.<br><br>**Part L2: non-domestic buildings:**<br>• performance standards for avoiding overheating from solar gain;<br>• performance standards for boilers, heating and hot water systems, some lighting fittings;<br>• performance requirements for air conditioned or mechanically ventilated buildings;<br>• calculation procedures to predict carbon emissions;<br>• requirements to install energy use meters; and<br>• requirements for Building Log Books to be provided. |

the Regulations should mean that more buildings will be modelled early in the design process. Modelling is a very useful design tool and the more it is used, the more likely it is that the resulting buildings will be comfortable and energy efficient.

## Certifying the quality of construction

Tightening insulation standards helps to reduce the heat loss (and heat gains) in a building, but heat can also be transferred by air through gaps and cracks in the building structure. The Regulations are intended to limit 'uncontrolled' air infiltration, which refers to gaps in the fabric rather than windows or vents that can be opened and closed.

Under the new revision, air pressure tests will have to be carried out (on larger buildings) when the building is complete to find if the building is sufficiently sealed against leaks. There is a target of 10 $m^3/hr.m^2$ at 50 Pa, which means that the building has to be pressurised, using a huge fan and can only leak a small amount.

It is generally accepted that the standard required in the new Regulations is roughly twice the tightness which existing buildings are being constructed to. Air pressure tests will therefore mean that buildings will ultimately have to be better sealed to pass, and so require less heating in winter and less cooling in the summer.

Checks on the continuity of insulation also have to be carried out under the new Regulations. This is good news for energy efficiency, as it is difficult to maintain quality control on-site and gaps are often left in the insulation.

Again, this may involve practical testing during construction. The continuity of insulation can be demonstrated by either certifying the design or by using infra-red thermographic inspection to show that there are no missing areas.

The consultation process suggested that air tightness testing standards could be progressively reduced from the currently proposed 10 $m^3/hr.m^2$ at 50 Pa to 5 and then perhaps to 3 in a further five years or so after that.

Overall, this will mean that design teams will design with air tightness in mind, and buildings will be constructed to a high standard to avoid the additional cost and delays of trying to seal up buildings and adding insulation after they have been built.

## Testing and commissioning the building

Buildings now have to be fully commissioned and tested before they are occupied, to ensure they are operating in the way they were designed. Up until now, commissioning of the building services can often be squeezed out of the building programme, as delays cause construction overruns and occupiers push to occupy as soon as possible. The commissioning time is the only part of the programme that can be squeezed, leaving buildings that are not fully tested and ready for occupation. This can have a profound effect on the energy performance of the building.

As part of the new Regulations, a suitably qualified person now has to confirm that all the building services systems meet the approved design. This means that all systems will now have to be commissioned correctly to recognised standards and that they are set up with energy efficiency in mind. This should help to ensure that buildings are ready to operate efficiently when they are first occupied.

## Bridging the gap between design and operation

The introduction of the Building Log Book for non-domestic buildings and the provision of information for domestic buildings both represent a great opportunity to start bridging the gap between building design and operation. All too often, building operators are left with a building that they do not understand. Operation and maintenance manuals describe the services and their operation in great detail, but this guidance rarely includes a non-technical summary of the energy efficiency features and usually does not contain details of the design targets for energy use.

Part L2 (non-domestic buildings) of the new Regulations requires a Building Log Book to be written. The Log Book will include a non-technical summary of the building and has to include the design team's predictions of energy use, so this can be compared with actual energy use. It is also suggested that the Log Book contains a simple description of the operation of the building services systems and how the metering system can be used to monitor and control energy consumption.

Additional content is suggested for the Log Book to certify that the building has been correctly commissioned (as discussed above) and is sufficiently air tight to meet the required standards. CIBSE is just beginning to develop a template for Building Log Books, which will be a useful guidance document.

This is starting on the road towards having a 'license to operate' a building. In fact, part of the consultation process when developing the current Regulations put forward the idea that later revisions (in roughly five years time) would include the idea that a building should not be occupied until the work has been certified as fully compliant with the commissioning plan.

The consultation process also suggested that regular tests of building operation could be carried out and report made. These regular tests would be like an MOT for buildings and could also be tied-in with a licence to operate.

Part of the draft proposal for a directive to the European Parliament on the Energy Performance of Buildings also put forward the idea of a building MOT.

The recording of predicted and actual energy use in the Building Log Book is excellent news for energy efficiency, as it is

The Building Research Establishment operates, at the request of the Office of the Deputy Prime Minister, a website containing an extensive list of frequently-asked-questions and their answers on Parts L1 and L2 of the Building Regulations. The site is aimed at both local authority Building Control departments and those seeking guidance on their own development.

***Go to:***
***www.projects.bre.co.uk/partlfaq***

the first step in providing a way to give feedback to the design team on the actual energy performance of the buildings they conceived. The next step would be to oblige design teams to receive a copy of the Log Book and take into account this feedback when designing further buildings.

## Metering strategy

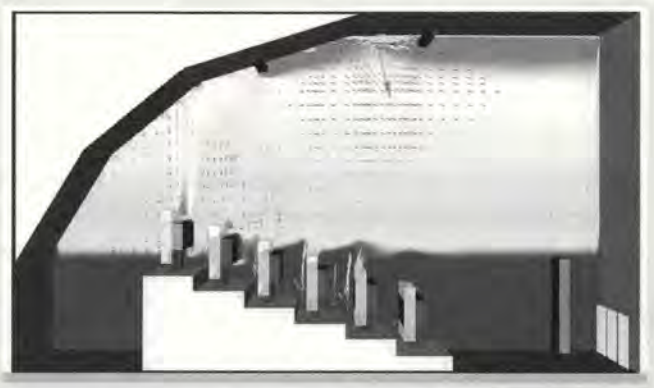
Obliging the operators of new non-domestic buildings to be able to meter all their major end-uses (for example, lighting, cooling, heating, computer suites, canteens, etc) will give building operators a powerful tool to understand where energy is being used in their buildings. Currently, most buildings do not have sub-metering and so energy audits have to be commissioned, which are expensive and time consuming.

A new guidance document published by BRECSU as part of the Government's Action Energy programme sets out the approach to developing a metering strategy to meet the new Regulations. The guide is called *General Information Leaflet 65 – Metering Energy Use In New Non-Domestic Buildings*.

Breakdowns of energy use can be compared to benchmark energy-use breakdowns (eg *Energy Consumption Guide 19 for offices* – also part of Action Energy) to see where exceptional amounts of energy are being used. For example, if twice as much energy is being used in lighting, as compared to the benchmark, then this is the place to start looking for savings. Combined with the Building Log Book, the building operator is being given two powerful tools to help manage and reduce energy use in their buildings.

## Energy efficiency of existing buildings

Now that major alterations to a building will fall under the new Regulations, the energy performance of the existing building stock will be gradually upgraded. Previously, it was possible to replace your old inefficient boiler with a new, equally inefficient one. Now a replacement boiler would have not only to meet the new efficiency standards, but also have a sub-meter and be included in the Building Log Book. Replacement windows and elements in domestic and non-domestic buildings will also have to meet the new tighter standards. This will start to have a profound effect on the current building stock as the proposed future revisions are implemented.



***Thermal modelling for a lecture theatre at the Department of Law of the Manchester Metropolitan University. Architect: John McAslan & Partners, engineer: Buro Happold.***
***© Buro Happold***

Improving the efficiency of existing buildings is the best way to reduce $CO_2$ emissions as new buildings only replace the existing building stock at a rate of roughly 2% per year.

## Summary

In summary, the long-term effects of the current and proposed revisions to the Buildings Regulations are:

- far better control over construction standards to ensure energy efficient buildings are built as well as designed;
- more emphasis on the commissioning and testing of buildings to ensure they are set up to be energy efficient before they are occupied;
- it will be more difficult to design 'all-glass' buildings and the use of external solar shading and/or 'smart' facades that control heat gains will become more commonplace;
- buildings are more likely to be designed using computer thermal models to predict internal conditions and energy efficiency;
- existing buildings will be slowly upgraded to the latest energy efficiency standards as they are refurbished;
- tight energy targets will mean more innovative and energy efficient solutions to heating and cooling buildings. This should help to reduce the number of buildings that use conventional (energy intensive) air conditioning systems;
- there is more onus on engineers to be involved in the design of the building fabric and more pressure on the whole project team to design buildings that can be built and operated with energy efficiency in mind; and
- feedback will have to be given to design teams and taken into account when designing each new building.

So, this revision to the Regulations has not only put tighter controls on designing for energy efficiency, but has also provided a framework to start controlling the construction, building management and refurbishment of buildings.

The Regulations also mean that design teams can start to get feedback on how their designs work, through various tests and Building Log Books. These tests will mean that designers will have to start listening to feedback and taking it into account when designing new buildings.

***Contact David Cheshire at Buro Happold, tel: 0207 927 9700, e-mail: david.cheshire@burohappold.com***

# Buro Happold

Buro Happold is a multi-disciplinary international practice of consulting engineers established in 1976 offering civil and structural engineering, mechanical and electrical engineering, quantity surveying, building services and environmental engineering, health and safety management, infrastructure and traffic engineering, ground engineering, façade engineering, fire engineering, computational fluid dynamics analysis, disability design consultancy, project management, urban design and a range of specialist CAD services.

# Tipping the balance tov

***Recent changes to the Building Regulations should tip the balance towards several energy efficiency technologies - such as external wall insulation and underfloor heating. Here, representatives of both industries put their case.***

## How the changes to Part L will affect underfloor heating

***by Rex Ingram, Managing Director, Osma Underfloor Heating***

**Carbon dioxide emissions** from homes and buildings can be dramatically reduced by incorporating greater efficiencies into the design, ranging from improved insulation to energy saving devices and more efficient operation. Cutting carbon emissions requires further improvements to the thermal efficiency of the building structure, but the use of energy within the structure now also becomes a planning issue. The heating system must now be thought through in detail *before* the planning application stage and, once approved, cannot easily be altered.

By making the structure more thermally efficient, the new Regulations reduce the amount of heating power (W/m²) that will be needed. As a consequence, it will be even easier to meet the calculated heat load using underfloor heating (UFH). In future, typical power requirements are set to fall within the range 35–70 W/m² and these can be easily produced - with floor surface temperatures of 23–26°

***The pocketed polystyrene system simplifies the installation of heating pipe within a screeded floor and can also provide a base for an inexpensive timber floating floor.***

One of the important commercial effects of the new Regulations will be to change the comparative costs of different forms of heating system. In the past, a radiator system could be used with relatively small amounts of floor insulation, whereas UFH required a lot more. From hereon, *any* form of heating system will have the same high amount of floor insulation and this will bring the *total* initial costs of radiators and UFH much closer.

Since April, the elemental U-value for floors has reduced from 0.45 to 0.25 W/m²K. For those UFH companies that continue thereafter to rely on using expanded polystyrene as the floor insulation, the total insulation thickness will need to become 110 mm. If it is laid as a single slab, this thickness will itself cause difficulties for suppliers of screeds and floating timber floors. At Osma Underfloor Heating, our own use of much stronger and thermally better extruded polystyrene means that we will standardise on a thickness of 75 mm, which will not only permit the floor build-up height to be contained but be structurally much more stable.

The new Part L also encourages the use of condensing boilers. There is little benefit to be derived from pairing a condensing boiler with radiators, because of the high flow water temperatures these generally use. Condensing boilers are kept in their most efficient, condensing mode when the return water temperature is below 53°C and this is almost always achieved when such a boiler is used with an UFH system.

If a business is planning to switch to UFH, it must check that its supplier is a Full Member of the Underfloor Heating Manufacturers Association (UHMA). Members have to satisfy basic requirements with regard to the quality of materials, design and installation standards used and have adequate levels of product and professional indemnity insurance.

***Osma Underfloor Heating is a partnership between plastic pipes and fittings manufacturer, Wavin Plastics Limited, underfloor heating specialist, ThermoBoard Limited and insulation manufacturer, Knauf Alcopor Ltd. Contact Wavin Plastics on tel: 01249 766600. Contact the UHMA at www.uhma.org.uk***

## Meeting the new Reg external wall insulati

***by Gillian Allder, Chairman, Insulated Render and Cladding Association (INCA)***

**The new Building** Regulations require a U-value of 0.35 W/m²K for walls in England and 0.3 W/m²K in Scotland, while Northern Ireland remains at 0.45 W/m²K. In order to meet these higher thermal insulation standards, specifiers are recognising composite construction using insulated render and cladding as a simple, energy efficient new-build method. Added to a concrete block to form a solid wall, or framed construction, this construction can go up faster than traditional building - yet still retain a traditional external appearance.

The Insulated Render and Cladding Association (INCA) feels that new building design should promote construction designs to achieve the 'heat sink' benefits of insulated renders and claddings. These

# wards energy efficiency

## gulations using on

place the insulation in the more effective position, within the outer skin, so maximising energy retention and resistance to external temperature extremes.

Whilst new-build design using insulated renders and claddings may necessitate certain changes in basic thinking in relation to construction and the building fabric, the appearance should not be radically different from conventionally constructed buildings. Whatever the method of construction, the end result is basically the same - a 'sandwich' effect comprising the structure, the insulation and decorative finish.

Systems, which are applied to the exterior walls of existing or new buildings, comprise an insulant and a weather protective finish, of which there are three main types:

- traditional renders and finishes;
- thin coat polymer and fibre reinforced renders and synthetic finishes; and
- preformed cladding materials.

By its very nature, the insulated render or cladding places the insulation where it will provide the maximum benefit to the completed building fabric. It does not create an adverse dew point situation and keeps the building in a good state of health. As long as it is mounted on the outside of the building, the insulation can be increased almost without limit to provide standards which may apply in the future, or to accommodate the needs of designers with special environmental requirements.

Steel stud with external weather grade cementitious board, insulation and render is becoming widely used in the new-build field, particularly with high rise commercial buildings. The steel stud element eliminates the need for bricklayers and blockwork, which are governed by the availability of suitable tradesmen and weather. Indeed, steel studwork can be pre-fabricated off-site ahead of it being required and quickly fixed in position using semi-skilled labour, immediately the structure is ready to receive it.

Once the cementitious board is fixed (in large sheet form - before or after delivery to site) and the joints sealed, the structure is watertight and internal trades can commence early, whilst the fixing of insulation and rendering externally follows, that is in parallel, thus speeding up the whole build process and reducing overall programme costs.

As a double guarantee and secondary precaution against water ingress, a breather membrane can be accommodated between the cementitious board and insulation. Similarly, additional insulation can be inserted between the steel studs to further improve the U-value or merely to increase the density to achieve better acoustic requirements.

***Contact the Insulated Render and Cladding Association on tel: 01428 654011, or visit the website at www.inca-ltd.org.uk***

## Open University Business School, Milton Keynes

The low energy Open University Business School, Milton Keynes won the 2002 INCA Award for the best new commercial building. The architect, Jestico + Whiles, specified a low energy building with a seamless finish, to provide a flexible environment in which to work. The StoTherm Mineral external wall system, with 200 mm mineral wool lamella insulation, played the major role in this, achieving a U-value of just 0.2 W/m²K. The jointless facade interacts fully with the surrounding timber and corten cladding and was achieved using high quality Stolit through-coloured render with a low maintenance finish.

## Striking Shoreditch flats

Nichols Court, 10 Cremer Street, London E2, won the 2002 INCA Award for the best use of external wall insulation in a new build residential project. The Shoreditch project comprises 68 flats and one penthouse maisonette, in six blocks, some sold and some allocated by the Peabody Trust on a shared equity basis. The flats, which were designed by Levitt Bernstein Associates have many 'green' features, most notably the external wall insulation system to achieve a U-value of 0.3 W/m²K, as specified by the architects and ahead of current Building Regulations. The StoTherm Classic system by Sto Ltd comprises expanded polystyrene insulation, 80 mm and 100 mm thick, mounted onto the load bearing blockwork walls, and given a long life, low maintenance finish of polymer modified render to achieve the durability and colour - yellow and white with blue highlights. The overall thermal performance of the buildings produced SAP ratings between 73 and 100.

# Leakage from compressed air sy

*by Graham Coats, EnergAir*

***The Government's Climate Change Levy has concentrated minds on all forms of energy efficiency, and the means to achieve it. Recently, one emphasis has been on the efficient use of compressed air. This is timely and reverses the age-old message that compressed air is cheap to produce. In truth, the leakage from ring main systems, and the inefficient running of compressors off-load, have done much to impair the competitiveness of UK industry. Graham summarises the basic advice that his company gives before recommending the installation of energy saving equipment such as compressor controllers and variable speed drives.***

**Compressed air is** generated using electricity, and the fact that its generation is equivalent to about 10% of industry's total electricity usage, rising to 30% in some sectors, highlights why companies have compelling reasons to investigate the potential for energy saving in this area. Recently, industry specialists have given added momentum to this new discipline by calculating that the operating costs of running multiple compressed air installations without some form of management control can be more than 30% higher than they should be. And this is just one aspect of a system, although usually the main one. To get the full picture the compressed air system as a whole needs to be examined, from the air compressor itself, to the dryer and filters which condition the air to the pipe work system that delivers it.

As anyone who has ever been concerned with compressed air systems will know, the most basic problem is leakage. Indeed, it has been calculated that leakage rates exceeding 50% of site consumption are common across many industries. For the user looking to save energy, eliminating these levels of leakage is a logical first step, especially as the costs involved are virtually negligible. But how to go about it?

## Avoiding Leakage

While every effort should be made to keep a compressed air system leak-tight, all systems will have some leakage. There are, however, several ways to reduce the opportunities for leaks:

Taking the negatives first: don't generate at a higher pressure than is necessary – the higher the pressure, the more air that will escape through a given-size hole - and don't keep your whole system pressurised during non-productive hours just because a few items of machinery require a constant supply of compressed air.

Looking at the positives: first, isolate parts of the system that require air at different times. Isolation valves can be operated manually or automatically using simple control devices like time switches or interlocks, or they can be controlled using your building energy management system, if you have one. Second, take advantage of the fact that under the Pressure Systems and Transportable Gas Containers Regulations, you must inspect your compressed air system regularly. These inspections are an ideal opportunity to find and repair leaks.

*Air tools can be a source of air leakage*

Having answered the first question of how to go about leakage elimination, the second is where to look for the leaks. In most systems the quick answer to this would be: just about anywhere. Logically though, the best place to start is at the compressor and then work outwards through pipe work and fittings to pneumatic equipment, tools and instrumentation.

## Pipework, Flanges and Fittings

The main artery for delivering compressed air is ring main pipe work systems. In many factories the pipe work is old and a prime source of leaks. A check of the system for pipe work sections that are leaking or corroded, followed by their replacement, will not only improve the system but will also improve safety.

In addition to the pipe work itself, large leaks are often found at connection points where screw fittings or flanges are employed. These leaks are frequently caused by pipe strain due to inadequate supports, inadequate joints or twisting.

## Manifold Connection Points

Another potential problem area is where connections to a usage point are made using snap connectors with flexible hoses. Sometimes several are used together, forming a manifold arrangement. Such manifolds can leak due to worn connectors and poorly jointed pipe work. In addition, where flexible hoses are used to make connections between the piping network and usage points, leaks can be caused by a number of factors including: damage to the hose, due to abrasion by surrounding objects: strain on the joint because the hose is too long or short, and by deterioration of the hose material, or just by choosing the wrong material, especially where the working environment is aggressive, oily or hot.

Before leaving the subject of connection manifolds, it's also important to remember that not all leaks occur through large connections. Many occur through wear on the tubing on small push-in connectors. Individually, these are of little note but when they are numerous the total leakage can be substantial.

# ystems is money down the drain

### Automatic drain traps

If a compressed air system uses automatic drain traps, these should be 'zero loss' types, and should be checked to determine whether they are functioning correctly. Some drain traps are not reliable and, in practice, they are often bypassed so that the condensate can be released from the system. This is undesirable, as large amounts of compressed air can be lost. A way to overcome this is to use electronically operated zero loss condensate traps. These are very reliable, and by fitting them the requirement for bypassing can be removed.

### Filters

Filters are an indispensable part of any pneumatic system. They can, however, be the source of quite large leaks. Potential problem areas are drainage points on the filter bowls, including poorly sealing automatic drains, badly fitted bowls and bowls that have been contaminated by synthetic compressor lubricant.

Downstream from the filter is not normally the area where the factory engineer would expect to make major savings by reducing leakage. This is true in the main, but useful contributions to the overall plant savings target can still be obtained by checking such things as connections to regulators, lubricators, valve blocks and sensors, and the internal air seals on pneumatic cylinders, which can cause large leaks.

### Air tools

Last but not least are air tools. These can consume large quantities of compressed air in operation. In many instances their consumption is exacerbated due to leaks that occur at the hose connection and/or the speed control valve. Worse still, occasionally air tools are left running, even when not in use.

***Contact Graham Coats at EnergAir Solutions Ltd,***
***tel: 01844 215 328,***
***e-mail: sales@energair.co.uk***

## Dual pressure compressed air system for windscreen manufacturer

**A new HPC** compressed air installation at Pilkington Automotive Ltd in Kings Norton, Birmingham, not only supplies compressed air at two different pressures to separate manufacturing applications, but also enables the high pressure system to back up the low-pressure system in the event of pressure drop. Designed by Compressed Air Services Ltd of Birmingham, the new system is saving over £25,000 per annum on energy and maintenance costs.

*The pressure reducing valve (centre of picture) which enables the high pressure compressed air system to back-up the low pressure system*

The new system replaces two ageing reciprocating compressors and a high-pressure (35 Bar) compressor, whose maintenance and energy costs came sharply into focus when issues concerning the Climate Change Levy were first discussed.

HPC says that its air demand analysis demonstrated that using a variable-speed drive compressor system would have resulted in control problems where there was no clear logical decision to be made about machine utilisation.

Compressed Air Services and HPC proposed instead the use of HPC's energy-efficient 1:1 drive DSD compressors. Some people talk of direct drive but really mean geared drive. In DSD packages, the motor drives the air end directly without transmission loss at speeds of 1,500 rpm via a maintenance-free coupling. Compared with compressors using small high-speed gear-driven air ends, 1:1 drive provides efficient power transmission and improved power consumption. The energy savings of the direct coupled compressors in this installation more than compensate for any benefit that would have been achieved by using variable speed drives, says HPC.

Compressed Air Services recommended two HPC Plusair CS121 rotary screw compressors for a separate part of the Pilkington operation, final finishing to a whole range of motor industry products such as side lights and toughened glass products from other factories in the group.

A clever solution was the introduction into the high pressure system of a pressure reducing valve (PRV) high in the pipework above the low-pressure system, which safeguards the general factory air supply. The system consists of a regulator set which receives air at 15 Bar and provides an output at 7.5 Bar. This is passed to a motorised valve which opens automatically if either of the two CS121 compressors – which make up the low-pressure system – is taken out of service.

The two DSD241 15 Bar compressors now supplying the high-pressure system have been calculated to be saving Pilkington Automotive in the region of £12,500 per annum, in comparison with the old high-pressure system, says HPC. The two CS121 7.5 Bar compressors which form the basis of the low-pressure system are said to be saving the company a further £12,900 per year.

***Contact HPC Compressed Air Systems,***
***tel: 01444 241671***

# Developing hydrogen

*By David J McGrath, Managing Director, ReGen Tech Ltd*

***Arguments for the wider use of hydrogen, particularly in fuel cells, are well rehearsed and have been presented in Energy World more than once. Here, David McGrath reports on efforts by his company and others to develop and market real hydrogen products.***

## Hydrogen as an energy store

Hydrogen is now beginning to be accepted as a useful form for storing energy for reuse on, or for export off, the grid. Clean electrical power harvested from wind and wave power projects can be used to produce hydrogen by electrolysis of water – splitting this into its constituent parts of hydrogen and oxygen. This is not a new idea. Jules Verne, in his novel *The Mysterious Island* proclaims "I believe that one day water will be fuel". Nor is it new technology, as it was used by Germany in the First World War to produce ammonia for its munitions industry, when it was starved of hydrocarbons by the allies.

The first Norsk Hydro bi-polar, filterpress water electrolyser was built in 1927 for use in the company's own ammonia plants. The two largest water electrolysis plants in the world were installed in Norway; they operate over 300 electrolysers and produce more than 60,000 normal cubic metres per hour ($Nm^3/h$) of hydrogen.

Production of hydrogen is an elegant environmental solution. Hydrogen is the most abundant element on the planet, it cannot be destroyed (unlike hydrocarbons) it simply changes state – water to hydrogen and back to water – during consumption. In its production and consumption there is no CO or $CO_2$ production and, depending upon method of consumption, the production of oxides of nitrogen can be avoided too.

But what of the oil industry? "We are at the peak of the oil age but the beginning of the hydrogen age. Anything else is an interim solution. The transition will be very messy, and will take many technological paths – converting fossil fuels and methanol to hydrogen, building hybrid engines and so on – but the future will be hydrogen fuel cells" – Herman Kuipers of Shell.

## Hydrogen production is big business

Hydrogen is already produced in huge volumes and used in a variety of industries. Current world-wide production is around 500 billion $Nm^3$ per year.

Most of the hydrogen produced today is consumed on-site, such as at oil refineries, and is not sold on the market. From large-scale production, hydrogen costs around $0.70/kg if it is consumed on-site. When hydrogen is sold on the market, the cost of liquefying the hydrogen and transporting it to the user adds considerably to production cost.

The energy required to produce hydrogen via electrolysis (assuming 1.23 V) is about 33 kWh/kg. For 1 mole (2 g) of hydrogen the energy is about 0.0660 kWh/mole. Practical electrolysers today achieve efficiencies of over 80% and, on this basis, electrolytic hydrogen can be regarded as a storable form of electricity. Typically it will take between 3.9 to 4.5 kWh to produce 1 $Nm^3$ of hydrogen by electrolysis. The variations reflect figures quoted by differing manufacturers.

## Storage of hydrogen

Hydrogen can be stored in a variety of forms:

- cryogenic; this has the highest gravimetric energy density;
- high pressure cylinders; pressures of 10,000 psi are quite normal;
- metal hydride absorbs hydrogen, providing a very low pressure and extremely safe mechanism, but is heavy and more expensive than cylinders; and
- chemical carriers offer an alternative, with anhydrous ammonia offering similar gravimetric and volumetric energy densities to ethanol and methanol.

## Consumption of hydrogen

Current thinking suggests that fuel cells are the path for the use of hydrogen and that the fuel cell industry is driving the hydrogen economy. This may be true but it loses sight of other, less costly opportunities. Hydrogen can also be used in:

- internal combustion engines;
- fuel cells;
- turbines: and
- cookers and gas boilers.

In towns and cities across the UK and America, lamplighters once lit gas street lights at dusk. Inside middle class homes, gas lamps provided light while gas heaters provided warmth. The gas that fuelled the lights and furnaces was a hydrogen-rich mixture called 'town gas', which was manufactured from coal and consisted mainly of raw hydrogen, some methane and small amounts of CO and $CO_2$. Town gas or hydrogen is still used today in many parts of the world, such as China and other Asian countries.

The traditional internal combustion

**How does electrolysis work?**

Electrolysers split water molecules into its constituent parts: hydrogen and oxygen. These are collected as gases, hydrogen at the cathode and oxygen at the anode. The process is quite simple. Direct current is applied to the electrodes to initiate the electrolysis process. The reaction that occurs is:

At the anode:

$4OH^- \Rightarrow O_2 + 2H_2O + 4e^-$

At the cathode:

$4H_2O + 4e^- \Rightarrow 2H_2 + 4OH^-$

The overall reaction is:

$2H_2O \Rightarrow 2H_2 + O_2$

# and fuel cell products


*Trailer-mounted, 5 kVA fuel cell unit designed to provide road-side emergency lighting*

engine can be converted to run on hydrogen. ReGen Tech can offer internal combustion engine conversion kits.

The BMW CleanEnergy World Tour 2002 is presenting the hydrogen technology and the hydrogen internal combustion engine to leading opinion leaders and decision makers from politics, industry and science. The goal is to establish a hydrogen infrastructure through global partnerships in order to cause the breakthrough of the fuel of the future.

At the opposite end of the vehicle spectrum, Green Heart Millennium Transport has been working on an inner city, two-seated (plus driver) electric vehicle for some five years. The vehicle, inspired by the need for tourist transport in enclosed environments such as the docklands, is similar in style to the auto rickshaw. The vehicle made its public debut at the 2002 Commonwealth Games.

Of course a whole range of fuel cell powered vehicles are in development for open road duty but Greenheart and ReGen Tech will have this vehicle, employing the Ballard Nexa fuel cell, available for inner city duty this year. The power unit will be available as a range extender for any electric vehicle similar in fashion to an LPG conversion kit.

The SiGen 5 kVA fuel cell unit is a direct replacement for diesel generators for road-side emergency lighting, traffic lights or signalling. It is designed for use within inner cities for night time duty, where noise and pollution can be a considerable nuisance, but where traffic and pedestrian safety cannot be compromised.

## Is this a pipe dream?

Several major hydrogen based projects are developing across Europe. Some are well advanced, such as the Iceland project (see below), while others in the construction phase and many more now in the planning. And there are others.

### *Promoting Unst Renewable Energy (PURE)*

The PURE project is being developed by the Unst Partnership to introduce sustainable renewable energy to the Shetland Island of Unst, making use of one of the best wind resources in the country, and combating some of the highest fuel costs.

The primary goal of the project is to provide a renewable energy solution that will deliver reliable electrical and heating energy through the use of wind power as the primary energy source, storing energy as hydrogen through electrolysis, and making available stored energy through combustion engines, turbines and fuel cells. A secondary aim of the project is to enhance the 'green island' image of Unst, and the value this adds to its eco-tourism and organic food and drink reputation.

An immediate project will be an uninterrupted power supply using ReGenTech's hydrogen/fuel cell UPS system for the main industrial estate on the island.

Preliminary system design utilises a wind turbine to capture the wind energy and convert this into electrical power. During times of low demand the intelligent load sensing control system will divert electrical power into electrolysers. This will then facilitate the production of hydrogen and oxygen gases, which can then be stored until required to produce electricity at times of low wind power. The stored gases can be reacted in a fuel cell to produce electrical power.

### *Iceland, creating the worlds first hydrogen economy*

An Icelandic consortium, Vistorka (EcoEnergy Ltd), of Daimler/Chrysler, Norsk Hydro and Royal Dutch/Shell is to test various applications utilising hydrogen fuel cells or hydrogen carriers. One of the first could be a hydrogen-powered, fuel cell bus service in Reykjavik. The joint-venture ultimately aims to convert both the public and private transportation sectors, including fishing vessels. Work will also be carried out concerning the effective production, storage and distribution of hydrogen and hydrogen carriers.

### *Utsira – hydrogen and wind*

The island of Utsira is located outside Haugesund in Norway. It produces no electricity of its own, but is connected to the mainland electricity net through a cable. However, the island is a good location when it comes to wind generated electricity. Through the production of hydrogen by electrolysers, it is planned to store the energy on windy days, to be used on more calm days by generating electricity using fuel cells.

### *Western Norway – hydrogen ferries*

Hydrogen is considered to be highly suitable as a fuel transport. Norsk Hydro recently started preliminary work on hydrogen ferries in co-operation with Marintec at NTNU in Trondheim and the Norwegian Institute for Energy Technology, among others. Originally intending to get an overview of the technical changes to convert an existing ferry to run on hydrogen-powered fuel cells, the goal was redefined, and widened to the use of hydrogen in marine transport in general.

***Contact David J McGrath at ReGen Tech Ltd, Aberdeenshire, tel: 01358 723843, e-mail: djm@regentech.com***

# Energy production and utilisation

*by JC Jones, Department of Engineering, University of Aberdeen.*

***Aberdeen's Clifford Jones looks at 20th century energy developments in the Far East. The article is based on a talk given at the Asian University of Science and Technology, Chon Buri, Thailand, in May this year.***

## Solid fuels

Coal utilisation purely for burning has been taking place for many centuries. The industrialisation of the world created a new use for coal: carbonisation to make coke as a metallurgical reductant in extracting iron from its ore. Previously charcoal, made by carbonising wood, had been used. Most of the southern counties of England were once very densely wooded, but these woodlands were denuded in order to provide starting material for the production of charcoal which, in turn, was used as a metallurgical reductant. By-products of carbonisation are, of course, tar and gas.

By a quarter of the way through the 20th century coal was, the world over, a staple fuel. A 1926 tome by Haslam and Russell gives an estimate of 1331 million tons for the total production of coal of all ranks in 1922. The US provided about 35% of that. The countries of interest in this article – those of the Far East – are rather vaguely included under 'other countries' (other than the US, Germany, Britain and its then Empire) in the analysis. Haslam and Russell also have this to say: "Little accurate information has been gained with regard to the coal reserves underlying large areas of Asia".

This rather negative summary would appear to express accurately the situation at time. Nevertheless, there was significant coal production in the Far East at that time, even if it was very small in comparison with that of the US. There was considerable production in China, especially of anthracite. An International Geological Congress held in 1913 concluded that the anthracite reserves of China "surpass the reserves [of anthracite] in all other countries combined". The most extensively worked coal field in China at that time was in the Province of Shansi. There was also coal mining in Sumatra, in the Malay Peninsula and in Japan, notably at Kiushui.

The paucity of knowledge in relation to coal reserves in the region of interest appears to have continued at least until the middle of the last century. ES Moore, writing at that time, states that 'Asia is well supplied with coal, although little is yet known regarding very large areas of that continent'. Moore does comment on the "enormous" anthracite deposits in China.

At the beginning of the 20th century, Japanese coal production amounted to about 3% of that of the US: in 1947 it was a mere 0.4% of the US total. However, these figures are undoubtedly skewed by the effects of World War Two. Coal in quantities of the order of tens of millions of tonnes was exported from China to Japan in 2001. Thailand, which had been producing low-rank coal since the early years of the 20th century, was by the 1970s producing about 5 million tonnes per year of lignite which, in spite of its very high ash content, provided most of the electricity for the country. Any specialist in power production from low-rank coal knows that boiler fouling by the ash, necessitating shutdown and cleaning, is a disruptive and expensive factor.

A 1920 book on fuel technology by HS Taylor reports a 1917 output of coal by Malaya of 55000 tons, and an output by North Borneo of 60,000 tons in the same year.

This section is headed 'Solid fuels', yet only coal has been discussed so far. Table 1 gives some examples of other solid fuels which have, in the region of interest during the period of interest, found usage.

***Table 1. Summary of usage of solid fuels other than coal***

| Fuel | Countries | Comments |
|---|---|---|
| Wood | Thailand | Thailand the world's largest producer of teak. Waste generated in the manufacture of products from teak are useable as fuel |
| | Japan | The industrialisation of Japan in the late 18th - early 19th centuries saw extensive use of wood as a fuel. Its eventual replacement with coal from Kiushui led to crop damage and other environmental problems |
| Coconut waste | The Philippines | Such waste also used as a gasification feedstock |
| Charcoal | Japan | Use of charcoal as a fuel in Japan since before the Christian era |
| Rice husks | Vietnam | Primary use as a domestic fuel |
| Mangroves | Malaya | Used in the sugar industry |
| Municipal solid waste (MSW) | Hong Kong | About 35 MW being added to the Hong Kong electricity grid from generating plant using MSW by the mid 1970s |

## Liquid fuels

By the middle of the twentieth century there was fairly minor onshore production of crude oil in Japan, Malaya, China and Burma. How minor is illustrated by the figures on the following page.

This brings us to what is, perhaps, one of the most significant facts at the interface of fuel technology and world affairs: that the shortage of domestic oil has been an

# in the Far East – a recent history

***Table 2. Comparison of Japanese oil production with that of other countries in 1946***

| Country | Oil production (millions of barrels) |
|---|---|
| USA | 1733 |
| Japan | 1 |
| Mexico | 49 |
| Iran, Iraq and Saudi Arabia | 256 |

important issue with Japan throughout her modern history, both in terms of industry and of military and naval capacity. Bowring and Kornicki emphasise this "Japan's economic success must be measured against its meagre resources. Japan is more dependent on imported energy than any other industrial nation."

One consequence of the shortage of domestic oil was the use during World War Two of shale-derived fuels by the Japanese Navy.

Between 1955 and 1970, the proportion of Japan's oil requirement that was met by oil increased from 15 to 70%. This was, however, brought about almost entirely by increased crude oil imports and increased refining capacity. By 1970 there was offshore oil production off Honshu Island, but this accounted only for a very small proportion of Japan's energy needs. At this time – circa 1970 – there was extensive exploration for offshore oil and gas in the Far East, and by the 1980s, Malaysia and Thailand both had productive offshore installations. Japan continued to struggle on, and by the end of the 20th century was described by the Petroleum Review as having "virtually no indigenous oil and gas resources". Table 3, based on information published in the Petroleum Review[7], gives a summary of the crude oil situation in other Far Eastern countries in closing years of the 20th century. The numerical data do not distinguish onshore from offshore production.

Concluding this discussion of liquid fuels in the same way that we concluded that of solid fuels – with reference to less orthodox fuels – we should first note the point made earlier that shale-derived fuels have been used for naval purposes by Japan. We should also note that there has been significant fuel use of alcohol in Vietnam.

## Gaseous fuels

By the beginning of the 20th century production of coal gas was an established technology in Europe and North America and therefore in the British 'possessions'. Consequently, in Singapore in 1900 such gas was available, and that year its manufacture there passed from private commercial to municipal control. More interestingly, to the present day there is extensive use of coconut waste in the Philippines as gasification feedstock. Total gasification with air and steam affords producer gas, and partial gasification produces 'coco gas' with charcoal and tars and oils as secondary products. Producer gas and coco gas have calorific values of respectively 4–5 and 11–12 MJ/m$^3$ and this appears to compare most unfavourably with 'coal gas', about 20 MJ/m$^3$ and natural gas, about 37 MJ/m$^3$.

However, not only in the Far East but around the world, producer gas served industry well for many decades, usually being prepared from coal or coke and having about the same calorific value as that made from a cellulosic feedstock such as coconut waste. Suffice it to say that a gas of 4-5 MJ/m$^3$ calorific value is, on a suitable burner, quite capable of melting steel. However, gas producers have diminished in importance. Many applications previously using producer gas have substituted for it liquefied natural gas (LNG) which, in the Far Eastern context, is discussed more fully below.

There was little production of natural gas in the region of interest by the middle of the last century. There is one important and quite remarkable exception. The gas field at Chi Liu Ching in China, which still appears in compilations of gas resources in that country, is known to have been producing gas since 211 BC.

In about the last quarter of the 20th century, several of the countries of the Far East have become major producers of natural gas, Indonesia most of all. A great deal of the natural gas produced by Indonesia is made into LNG, which can be transported by sea in specially-built vessels. Indonesia is currently the world's largest exporter of LNG. Japan imports a great deal, as does Malaysia. Special reception facilities are of course needed to transfer the LNG from the vessel carrying it to storage facilities at the destination. By 2003 Malaysia will have the largest such facility in the world, at Bintulu.

***Contact JC Jones at email: j.c.jones@eng.abdn.ac.uk***

***Table 3. Oil production in Far Eastern countries at the close of the 20th century***

| Country | Crude oil situation |
|---|---|
| Malaysia | 700,000 barrels per day of crude oil produced. More than half of it exported. |
| China | The third largest oil producer in the world. A net importer of oil since 1993. Most of the oil from ageing and declining fields in the east and north east of the country. Prediction that by 2010 43% of China's oil needs would have to be met by imports. |
| Vietnam | The fourth largest oil producer in South East Asia. 8.5 million tonnes exported during the first half of 2001. A further, potentially very productive, field is being developed by Petrovietnam. |
| Thailand | 500 barrels per day from the Plamuk field, operated by Unocal. Further offshore installations being commissioned. |
| Brunei | A mature oil province now in decline. |
| Cambodia | Exploration at promising sites following a memorandum of agreement with Thailand concerning previously disputed ownership. |
| Taiwan | Indigenous reserves are almost non-existent. |

# Events

## October

**Gas 2002**
Seminar, 2 October, Coventry
Contact: SBGI
Tel: 01926 462916
Email: events@sbgi.org.uk

**European coal outlook**
Conference, 7-8 October
France
Email: sarah.fell@informa.com

**Advanced sensors and instrumentation systems for combustion processes**
Technical meeting, 9 October
London
Contact: Professor Yan
Tel: 01634 883732
Email: y.yan@gre.ac.uk
**Co-sponsored by the Institute of Energy**

**ENVEC 2002**
9 October, Weston-super-Mare
www.oursouthwest.com/envec

**Recent advances in coal science and their applications**
Lecture, 14 October, London
Contact: BCURA - David McCaffrey
Tel: 01242 224886
Email :
BCURA@gardnerbrown.co.uk

**InstE Branch Event**
**Yearbook launch**
14 October, Belfast
Contact: Northern Ireland Branch - Ciaran McGrath
Email:
mcgrathc@belfastcity.gov.uk

**EEMEX 2002**
Exhibition 16 October
Huddersfield
Tel: 01484 510010

**Clean energy from the heart of the earth**
Conference, 16 October
Nottingham
Contact: IMechE
Tel: 0207 304 6841
Email:
l_feinberg@imeche.org.uk

**Utility metering services**
Seminar, 16 October, Coventry
Contact: SBGI
Tel: 01926 462916
Email: events@sbgi.org.uk

**Energy management**
Short course, 17 October
London
Contact: Institute of Energy
Tel: 020 7580 0008
Email:
events@instenergy.org.uk

**InstE Branch Event**
**Alternative fuels for road vehicles**
17 October
University of Bristol
Contact: South Wales and West of England Branch - Geoff Spiller
Email: gspiller@ntlworld.com

**Microwave and radio frequency heating**
Course, 17-18 October
Cambridge
Contact: AC Metaxas & Associates
Tel: 01223 277390
Email: acm@eng.cam.ac.uk

**InstE Branch Event**
**Energy security and update on merger developments**
Lecture, 21 October, London
Contact: London & Home Counties Branch - Matt Leach
Email: m.leach@ic.ac.uk
Tel: 020 7594 9328

**Sustainable Energy/Energy Efficiency Exhibition**
22-24 October, London
Contact: IIR Conferences
Fax: 020 7850 7502
www.sustainable-expo.org
**Co-sponsored by the Institute of Energy**

**InstE Branch Event**
**Visit to Lochgilphead housing scheme**
23 October
Contact: Scotland Branch - Renate Powell
Tel: 01866 822 116
Email:
renate@powellconsulting.co.uk

**Renewable power delivery**
Conference, 23-24 October
London
Tel: 020 7915 5115
Email: renewconf@iirx.co.uk

**Financial mathematics to energy derivatives**
Course, 24-25 October
London
Contact: Energy & Power Risk Management
Tel: 020 7484 9898
Email: conf@riskwaters.com

**General introduction to electricity markets**
Course, 28 October - 1 November Berkshire
Contact: IPE Training
Tel: 020 7265 3745
Email: training@ipe.uk.com

**Professional practice for sustainable development**
Short course, 29 October
London
Contact: Institute of Energy
Tel: 020 7580 0008
Email:
events@instenergy.org.uk

**Energy efficiency: performance of buildings**
Conference, 29 October
Watford
Contact: Institute of Energy
Tel: 020 7580 0008
Email:
events@instenergy.org.uk

**Renewable bioenergy: technologies, risks and rewards**
Conference, 29-30 October
London
Contact: Helen Ricardo, IMechE
Tel: 020 7973 1304
Email:
h_ricardo@imeche.org.uk
**Co-sponsored by the Institute of Energy**

## November

**Corporate governance**
Workshop, 4 November
Contact: Di Hammet
Tel/Fax: 020 8767 9744
Email: BEAwec@aol.com

**Developing, constructing, operating and securing power projects**
Conference, 6-7 November
London
Contact: Melanie Crocker
Tel: 020 7881 1886
Email: melanie.crocker@hawksmere.com

# Events

**Heat transfer - principles and practice**
Course, 6-8 November
Teddington
Contact: Robert Angus
Tel: 020 8943 7110
www.npl.co.uk/thermal/heattransfer

**InstE Branch Event**
**Compressed natural gas as a vehicle fuel**
Seminar, 7 November
Birmingham
Contact: Midlands Branch - Vian Davys
Tel: 01332 666296
Email: vian.davys@eme.co.uk

**Introduction to electricity trading**
Course, 11-13 November
Berkshire
Contact: IPE Training
Tel: 020 7265 3745
Email: training@ipe.uk.com

**Risk in uncertainty**
Lecture, 13 November, Hatfield
Tel: 01727 813613
www.mybusinesslink.co.uk/risk

**InstE Branch Event**
**Woking fuel cell visit and talk on the CHP consultation**
Date to be confirmed
Contact: London & Home Counties Branch - Matt Leach
Email: m.leach@ic.ac.uk
Tel: 020 7594 9328

**InstE Branch Event**
**Green energy trading**
Lecture, 13 November
Contact: South Coast Branch, Chris Wilson
Tel: 01252 673570

**A strategy for delivery – to 2010 and beyond**
Conference and annual dinner
14 November, London
Contact: CHPA
Tel: 0207 828 4077
Email: info@chpa.co.uk

**Bioenergy**
Conference, 20 November
Shepton Mallet, Somerset
Contact: British Biogen
Website:
www.britishbiogen.co.uk

**Mechanical Engineering**
Congress, 17-22 November
USA
Contact: Professor Yildiz Bayazitoglu
Fax: +1 732 348 5423
Email: bayaz@rice.edu

**Liberalisation in the natural gas markets**
Course, 18-22 November
Berkshire
Contact: IPE Training
Tel: 020 7265 3745
Email: training@ipe.uk.com

**Nemex 2002**
Conference and exhibition
20-21 November, Birmingham
Contact: Zoe Bragg
Tel: 020 7772 8451
Email: zoe_bragg@mrn.co.uk
**Co-sponsored by the Institute of Energy**

**Climate policy for the longer term**
Conference, 21-22 November
London
Contact: RIIA
Tel: 020 7957 5700
Email: contact@riia.org

**InstE Branch Event**
**Gasification technology**
Workshop, 25 November
University of Newcastle
Contact: North East Branch - Andrew Cox
Tel: 0191 261 5274
Email:
awcox@eimr.demon.co.uk

**Advanced gas and electricity trading**
Course, 25-29 November
Berkshire
Contact: IPE Training
Tel: 020 7265 3745
Email: training@ipe.uk.com

**National engineering conference**
Conference, 27 November
Castle Bromwich
Contact: Ellen Luetchford
Tel: 01257 244910
Email: ellenl@centra.org.uk

the institute of energy

## Professional Practice for Sustainable Development

***Led by Rob Wall, this one day course is designed to enhance participants' understanding of sustainable development, and includes the use of case studies from business and industry to illustrate how sustainable development is currently being applied.***

***This course is being held in London on Tuesday 29 October and costs £100 for InstE Members and £150 for Non-Members.***

***Please contact Katie Moore on 020 7580 0008 or email events@instenergy.org.uk to register your interest and receive further information.***

**Registering on an event seen here?**
**If you are registering on an event which you have seen listed here, please don't forget to mention to the organisers that you saw it listed in the *Energy World* Events Diary.**
**For further information about events, and to view the Institute of Energy's events calender please click on to our website at: www.instenergy.org.uk/community**
**InstE Branch events are open to everyone regardless of the branch they are organised by.**

# Members' meetings to discuss the merger proposal

**Branch members** have been working with senior officers of the Institute of Energy to organise meetings at locations across the UK to discuss the merger proposal, summarised in a prospectus issued to all current members at the end of September. Separate arrangements using web-based technology to communicate with overseas members has also been arranged. Provisional details for the meetings are given in the list below, but please do get in touch with the designated contact to ensure your place to attend is secured. Further information about the meeting of your choice will be provided at a latter date. For some venues, places will be limited due to available space so please book your place at your earliest opportunity. The views of all members are important and very much valued in this discussion about the Institute of Energy's future.

| Branch | Contact Name | Email | Date |
|---|---|---|---|
| East Midlands | John Parsons | john.parsons@advanticatech.com | tbc |
| London & Home Counties | Matthew Leach | m.leach@ic.ac.uk | 21 October 2002 |
| Midlands | Ken Parker | ken.parker@tesco.net | 31 October 2002 |
| North East | Terry Heppenstall | pipedreams@btinternet.com | tbc |
| North West | Eric Curd | eric.f.curd@btinternet.com | tbc |
| Northern Ireland | Herbie Wright | Herbie@wrighth30.fsnet.co.uk | 14 October 2002 |
| Scotland | Robert Crusher | robc@newpig.com | 10 October 2002 |
| South Coast | Don Barber | rufusred@aol.com | 18 September 2002 |
| South Wales & West England | Geoff Spiller | geoff.spiller@babcockbes.co.uk | 9 October 2002 |
| Yorkshire | Andrew Mallilieu | info@facultatieve-technologies.co.uk | 24 October 2002 |
| Hong Kong | tba | - | tba via web |

*NB Please ensure that you notify the relevant contact person as soon as possible if you wish to attend the meeting, so we can book appropriate venues. Please note that once venues have been finalised, the details will be available on the website for your information.*

# Members' reference library

**One of the** rooms in the basement of 18 Devonshire Street has been converted into a small reference library, for members' use. The library consists of a collection of books, conference proceedings and reports. The library also holds past Institute of Energy and Institute of Fuel conference proceedings, books and journals dating back to 1927.

Subjects covered in the library include solar, renewables, energy policy, buildings, nuclear, gas and oil.

Back issues of *Energy World* are available for members to view as well.

A collection of recent energy, environment and engineering magazines and journals are also displayed.

Members are welcome to visit and use the library. ***For more information, please contact the librarian at info@instenergy.org.uk***

# Gift Aid your subscription

**Gift Aid is** a scheme whereby you can give a sum of money to charity and the charity can reclaim from the Inland Revenue the basic rate tax you have paid on your gift. This means that every £10 you give to charity is worth £12.82 to that charity.

The InstE is a registered charity and your subscription payment is classed by the Inland Revenue as a charitable donation. It is possible therefore, for the Institute of Energy to reclaim the tax paid by you on your subscription. However it is also possible for you, as a taxpayer, to claim tax relief through your tax return or PAYE code for your subscription payment. Gift Aid is therefore not going to be of use to the Institute of Energy for its taxpaying members. Retired members, however, are not permitted to claim relief on their subscription payments so for any member who is retired, but is still paying tax, why not let the Institute of Energy have the tax that you can no longer claim back.

If you'd like more information please contact your tax office with a specific query about your circumstances, or Sarah Beacock, Membership and Education Manager on 020 7580 0077, for more general information about the scheme. There will be a box on your next subscription notice which will allow you to opt for the Gift Aid scheme.

# Help expand our EEAS Moderators Panel

**The Government** Climate Change UK Programme in November 2000 highlighted the Energy Efficiency Accreditation Scheme as "the national benchmark standard in energy efficiency".

The scheme enables achievement in the management and use of energy to be tangibly recognised, through an award from the leading professional body, the Institute of Energy. Since it was launched in 1993, over 150 leading organisations in business, industry and the public sector have gained accreditation. They have done so by demonstrating:

- management commitment to energy efficiency;
- investment, both actual and planned, in energy efficiency measures; and
- a record of progressive improvement in energy efficiency.

An independent moderator must evaluate the EEAS Assessor's recommendations for an award to be granted. The InstE currently has four EEAS Moderators to share the volume of work which, including submissions for re-accreditation, now exceeds 50 applications per annum. This number is increasing each year as organisations recognise the need for good energy management and the InstE wishes to accommodate this by expanding its panel of moderators.

Your skills and experience could be valuable to this scheme and its course of accreditation.

***If you would like to discuss how to become involved as an EEAS Moderator, please contact Vicky Ratcliffe on 020 7580 7124 or at education@instenergy.org.uk***

The Energy Efficiency Accreditation Scheme was originally developed by the Energy Systems Trade Association, in conjunction with the Institute of Energy. It is now managed by the National Energy Foundation, endorsed by the CBI and supported by Powergen.

# Sustainable energy and energy efficiency under one roof

**On 22-24 October** 2002, the Sustainable Energy and Energy Efficiency exhibition opens its doors to the industry at Olympia, London. With over 100 exhibitiors including the Institute of Energy, this exhibition will be a one-stop-shop providing hundreds of new products, solutions and ideas, all designed to help reduce energy costs and minimise the impact that energy usage has on the environment.

The Sustainable Energy expo offers the private and public sectors the best chance to discover how sustainable energy technologies can help them meet their energy needs. This exhibition will provide information on all aspects of green energy including wind, solar and photovoltaics, combined heat and power, bio energy, wave and tidal, hydro, geothermal, fuel cells and hydrogen.

And, as it's running alongside the Energy Efficiency expo, there'll be even more solutions to energy problems to uncover. Proactive energy efficiency and energy management are major issues for many organisations. The introduction of new legislation, increased awareness and better solutions are making investment in energy efficient strategies and technologies very important, and make attendance at this exhibition essential.

***Visit www.sustainable-expo.org for more information.***

# Major conference to review the EU Energy Performance of Buildings Directive

**The adoption** of the Energy Performance of Buildings Directive by the EU Council of Ministers on 6 June will have far-reaching implications for the owners, operators and developers of buildings in the UK.

A major conference organised by BRE and the Institute of Energy to be held on 29 October 2002, in association with CIBSE, will review the requirements of the Directive, together with its likely impact on the UK construction sector.

With buildings in the UK accounting for nearly 50% of all $CO_2$ emissions, the Directive provides a significant and realistic opportunity to achieve a substantial reduction in energy usage within buildings. David Strong, Managing Director of BRE's Energy Division says, "major issues remain to be resolved regarding implementation of the Directive; this conference provides an important opportunity for informed debate."

Louise Kingham, Secretary and Chief Executive of the Institute of Energy says "the Directive provides opportunities to improve energy efficiency in existing and new buildings and the conference will be of particular relevance to anyone involved in the procurement, design, construction or management of buildings." The Directive becomes a legal requirement in the UK within three years and it has profound implications for the UK construction sector - with attendance at this event being particularly recommended for anyone concerned with the future strategic direction of their business.

***For more information, please contact Katie Moore on: 020 7580 0008 or email: events@instenergy.org.uk***

# New Members

### South Wales and West of England

**Cornwall Sustainable Energy Partnership**
**Group Member**

**Mr R Matthews MInstE**
PLE International

**Mr D A Cowley, Graduate**
Bristol City Council

**Mr T Furness, Student**
Glamorgan University

### North Western

**Sefton Council**
**Group Member**

### London and Home Counties

**Dr S H Nasser FInstE**
University of Hertfordshire

**Mr G Gatti, Graduate**
Ove Arup & Partners

**Mr J M Bailey, Graduate**

**Mr E Okosun, Graduate**

### Scotland

**Glasgow Caledonian University,**
**School of the Built & Natural Environment**
**Academic Affiliate**

### South Coast

**Southern HECA Network**
**Group Member**

**Mr A R Richardson MInstE**
BG Group

### Midlands

**Healthy Homes Partnership Scheme of Newcastle-under-Lyme Borough Council**
**Group Member**

### North Eastern

**KNW Ltd**
**Group Member**

### Northern Ireland

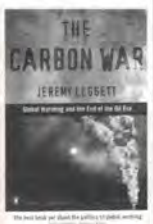
**Dr P W Griffiths MInstE**
University of Ulster

***Deceased Members***
***Mr Edward Smith FInstE***
***Dr Kenneth Littlewood FInstE***

## Feedback on Energy World


***We are currently evaluating the format and design of Energy World to see how we can improve the publication to meet your ongoing needs. If you have any ideas to make it even more useful we'd like to know. Please email your suggestions for design improvements or new features to Joanna Heke at jheke@instenergy.org.uk***
***We look forward to hearing your views.***

## Membership Offer




***Members of the InstE can purchase Jeremy Leggett's book 'The Carbon War' for the discounted price of £7.99 (including P&P) via our website: www.instenergy.org.uk/publications***

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