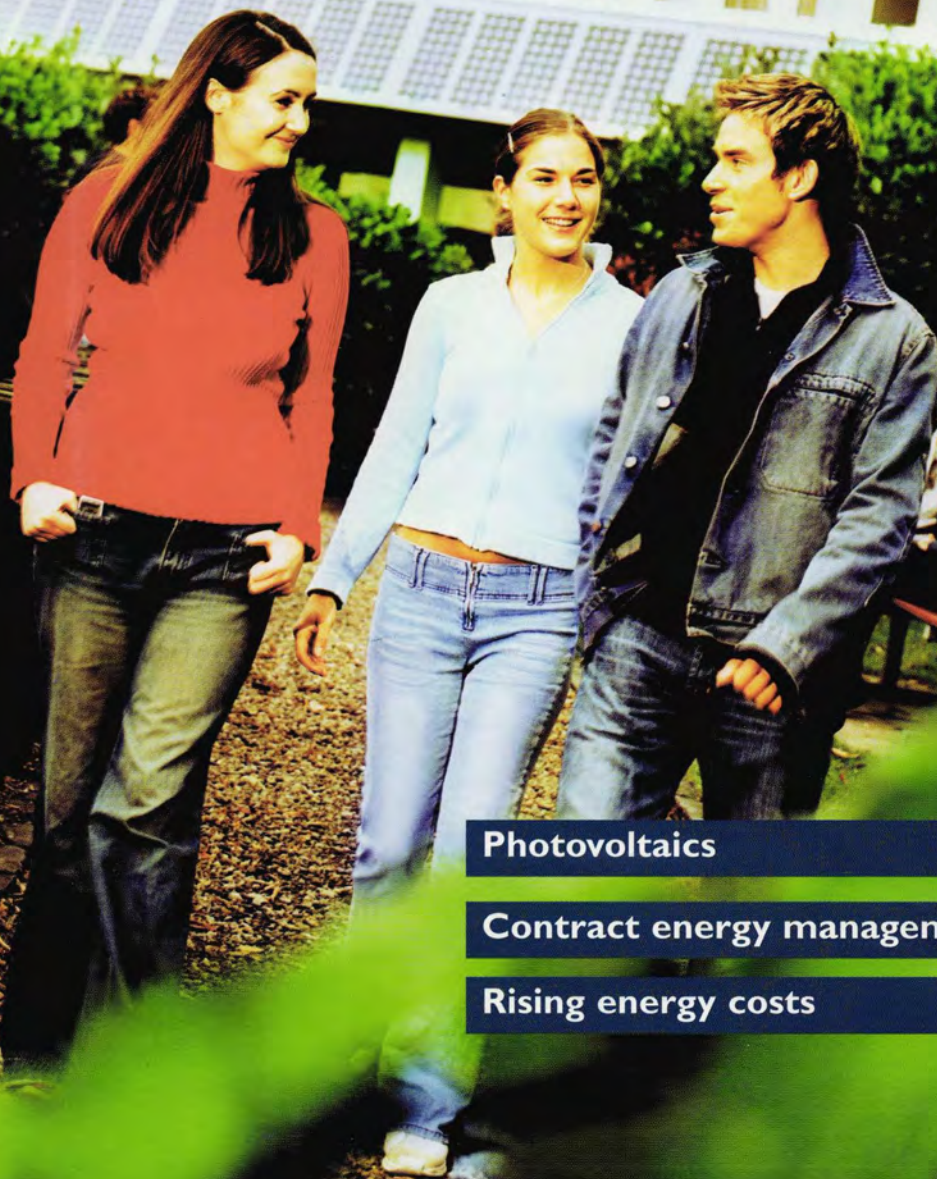


June 2004
No. 320

energy



World



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The Energy Institute is pleased to announce

Sir Roy Gardner,
Chief Executive Officer, Centrica
as the recipient of the
70th Melchett Award

22 June 2004, 4 Hamilton Place, London, W1



This free event is a unique opportunity to hear Sir Roy talk about the issues that matter to the energy industry today.

Sir Roy Gardner receives this award for his outstanding contribution to the energy industry. Before joining British Gas, Sir Roy Gardner was Managing Director of GEC Marconi and was appointed to the Board of GEC in 1994. Sir Roy was Chief Operating Officer of Northern Telecom Europe following their take-over of STC, previous to which he was Managing Director of STC Communications Systems and a member of the Board of STC. He joined STC in January 1986 as Finance Director from the Marconi Company where he was Group Finance Director between 1979 and 1985. Sir Roy began his career at the British Aircraft Corporation where he worked in the Commercial Aircraft Division.

On 1 January 2000 Sir Roy was appointed as a Non-Executive Director of Manchester United, and assumed the role of Non-Executive Chairman on 31 March 2002. He was a Non-Executive Director of Laporte plc from December 1996 until the company's takeover in April 2001.

In February 1998 he was appointed President of the Carers National Association, now Carers UK. He is also a Trustee of the Development Trust (for the Mentally Handicapped) and was appointed as Chairman of the Employers' Forum on Disability at the beginning of February 2000. In December 2002, Sir Roy was appointed by the Chancellor, Gordon Brown, as Chairman of the Modern Apprenticeships Task Force and he also Chairs the Ambition: Energy panel.

Sir Roy is a Fellow of the Chartered Association of Certified Accountants, the Royal Aeronautical Society and the Royal Society of Arts. He is also a Member of the Advisory Council of the Prince's Youth Business Trust and a Companion of the Institute of Management.

Programme:

- 17.45 Registration
- 18.15 Welcome by Professor Martin Fry, CEng, FEI, Vice President Energy Institute
- 18.30 Lecture by Sir Roy Gardner
- 18.50 Questions from the floor
- 19.20 Drinks reception

Attendance by pre-registration only.

Please return to: Marta Kozłowska, Energy Institute, 61 New Cavendish Street, London W1G 7AR, UK t: +44 (0)20 7467 7105 f: +44 (0)20 7580 2230 (one form per person please)

I will attend the meeting 'The Melchett Lecture,' Tuesday 22 June 2004

Name

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Installed ten years ago at the Northumberland building of Northumbria University, Newcastle-upon-Tyne, the UK's first large-scale solar photovoltaic (PV) demonstration scheme has generated more than 150 MWh of electricity to date. Now, Northumbria and Durham Universities are collaborating on a new PV research project – see page 9.

Micropower – where mass consumer behaviour could make a difference



Dave Sowden, Chief
Executive, Micropower
Council

Last year's Energy White Paper began with a stark message: "our country needs a new energy policy", and correctly points out that "today's policy will not meet tomorrow's challenges." A step change is needed, but how do we find a trigger for such change? How do we set about winning the hearts and minds of the public?

There is a small solution to this big problem – or rather several, under the umbrella term 'micropower' (or microgeneration). This refers to individuals, small businesses and communities generating some of their own low-carbon power. Options include ground source heat pumps, solar hot water systems, wood pellet boilers for heating, and solar photovoltaic (PV) panels, micro-wind turbines, micro-hydro systems and microCHP for low-carbon electricity.

These technologies have a number of benefits. For a start, they reduce carbon dioxide emissions (an Energy White Paper goal) by displacing central, inefficient generation. They also avoid transmission and distribution losses. In large numbers, they would provide significant diversity in supply (another Energy White Paper goal). This is important not just as a hedge against individual power station failures, or the risk of terrorist attack, but also against financial risk. Recent high profile cases of energy companies coming close to or actually collapsing, illustrate the possible benefits of millions of consumers generating part of their own power. Some micropower technologies also tackle the White Paper Goal of providing adequate and affordable home heating.

And let's not forget the fourth goal of the Energy White Paper – maintaining UK competitiveness. Consumers generating their own power means lower energy costs, and greater consumer spending power. It also provides jobs in cutting edge, high technology industries, as well as intellectual property and future dividends for UK companies.

The really good news is that the figures work, and that these technologies pay for themselves over time. One company produces a domestic-scale wind turbine that costs just £950 to install. A leading microCHP developer claims that reduced energy bills will pay for the price premium over a condensing boiler within five years.

So what is it about micropower solutions that will engage consumers where others have failed? The answer lies in consumers taking pride in their initiative, selling the concept to friends and family, and having a daily reminder that they are making their contribution. Insulated cavity walls and lofts are hidden; energy efficient light bulbs give questionable aesthetic pleasure, and a condensing boiler is just

there, preferably out of sight, and often much to the disapproval of the local heating service engineer.

By contrast, the owner (and their neighbours) of a small, roof-mounted wind turbine is served with a frequent reminder that they are making a contribution. The microCHP unit, whose kitchen wall-mounted control panel spells out, for example, that a customer is currently generating 50% of their own power, leads not only to a daily reminder for the customer, but also to dinner party discussions when guests start to enquire what it means. But it goes further than this: because they have a daily reminder, these consumers will be more aware of the need to switch off unneeded lights, moderate their use of heating, and improve control systems. In this way, micropower can act as a catalyst for a cultural change in the way consumers use energy in their daily lives.

This message seems to be getting heard in the corridors of power: Energy Minister, Stephen Timms, responded warmly to a suggestion that Government and the industry should consider the development of a public policy strategy to promote microgeneration. The Energy Bill, which passes into Committee Stage in the House of Commons in June, provides for the Government to develop such a strategy, and set out targets for levels of microgeneration in years to come. The Bill still has a long way to go before becoming law, but this marks the first time microgeneration has been recognised in a bill, and can be seen as proof that micropower has, if not arrived, then definitely begun the journey.

Still, it will take a lot of work to get micropower off the ground, and there are many hurdles to be overcome before the various technologies can reach their full potential. So, on 21 April, Lord Ezra, opened the inaugural meeting of the Micropower Council, a new body representing micropower developer companies and interested trade associations and professional bodies.

The Council has a lot of work ahead of it. It hopes to see new financial incentives for consumers, encouraging them to invest in home-based power generation; power network charges that reflect the benefits microgeneration brings to networks; simple procedures for network connection and metering; proper payment for power exported by consumers back to the grid; recognition of microgeneration in the Building Regulations; and the use of planning guidance to encourage microgeneration in new buildings.

Given the right policy framework, micropower could be the key to unlocking the potential of a consumer-driven culture change towards the use of energy.

Contact Dave Sowden via
the Micropower Council
press office on tel: 0207
630 5040

Emissions trading scheme 'will raise power prices by up to 40%'

The European Union Emissions Trading Scheme (EU ETS) will increase electricity prices in all major European markets, but its impact locally will be different across these countries due to their very different mixes of generating plants. So says the US-based Global Insight Inc, on the release of its annual *European Power Price Report*.

The scheme, scheduled for implementation from January 2005, will make it more expensive to generate electricity using carbon-emitting fuels such as oil, gas and coal by putting a price on carbon dioxide emissions. Despite the fact that at least 95% of the available emissions permits will be allocated free in the first phase of the scheme (2005-2007), the price at which those allowances are subsequently traded will directly affect operating decisions. As a result, the notional or opportunity costs of the emissions will still be passed through to consumers in the form of higher prices, says the report.

Generators with the largest carbon dioxide emission allowances will receive the largest revenue windfall. According to the study, Germany and the UK will see the largest wholesale electricity price rises, due to their strong reliance on coal plants to generate electricity, resulting in prices increases of as much as 40% by 2010.

Power prices in Italy are forecast to rise 15%, given current carbon dioxide market prices. The smaller forecast impact on Italian prices is due to its unusual mix of zero-carbon hydropower and high-carbon oil-fired plants. Spain and the Netherlands are also forecast to fare better, with electricity prices rising by between 10% and 20% by 2010, depending on the market price for carbon dioxide. Both countries rely primarily on gas-fired, low carbon-emitting power generation. Spain also benefits from its hydropower plants..

Greenhouse gas 'reducers' join forces

A new international grouping of regional and national governments, large business interests and environmental organisations – a "coalition of the world's leading reducers of greenhouse gas emissions" – has been launched with the backing of UK Prime Minister Tony Blair. The initial group, which includes some of the world's largest emitters of greenhouse gases, intends to draw more businesses and governments into making the emissions reductions necessary to avert climate change.

Climate Group founder members and supporters, a curious mixture of big industry, local government and NGOs, include the German Government, the US States of California and Connecticut, the Australian State of Victoria, BP, HSBC, Lafarge, NorskeCanada & The Canadian Forest Products Association, Shell Renewables, Swiss Re, The Greater London Assembly, Greenpeace UK and WWF-UK.

The slow progress of international negotiations by governments has spawned a host of smaller-scale and unilateral initiatives to cut carbon emissions, from both public and private sectors, says the Group. It is this

US Government funds research into hydrogen storage

The US Government is getting serious about hydrogen research – particularly hydrogen storage for vehicles. Thirty-two hydrogen research projects have been awarded a total of \$350 million in grants over five years by the Department of Energy (DOE). Private funding will add another \$225 million to support the projects, which involve more than 130 organisations, including academia, industry, and DOE national laboratories.

The award represents nearly one-third of President Bush's \$1.2 billion commitment in research funding to bring hydrogen and fuel cell technology 'from the laboratory to the showroom'. Rising world oil prices, falling US production and increasing import volumes have made research into alternative transport fuels a top priority for the US.

The awards will help establish three 'Centers of Excellence' for hydrogen storage research at DOE national laboratories. Los Alamos National Laboratory and Pacific Northwest National Laboratory will combine forces to investigate chemical means of hydrogen storage; Sandia National Laboratories will investigate metal hydrides; and the National Renewable Energy Laboratory will investigate storage in nanoscale 'sponges' made of carbon. Together, the three centres will tackle DOE's 'Hydrogen Storage Grand Challenge': how to store enough hydrogen in a car to enable it to go at least 300 miles on a fill-up without impacting cargo or passenger space.

In addition, 15 individual projects will investigate aspects of hydrogen storage; five will research fuel cells for off-road applications, auxiliary power generation, and consumer electronic devices; and four projects will advance hydrogen energy education. Five teams of car manufacturers and energy companies will demonstrate fleets of fuel-cell vehicles integrated with hydrogen refuelling stations.

Meanwhile, new California Governor Arnold Schwarzenegger has signed an executive order to create a public/private partnership to build a 'hydrogen highway' in the state by 2010. The Hydrogen Highway Network initiative aims to speed the transition to a hydrogen transportation economy in California by building a network of 150 to 200 hydrogen fuelling stations throughout the state.

sort of creative energy that the new Group will tap into.

"The Climate Group is looking beyond Kyoto, which is a first step in driving reductions," said Group CEO Dr Steve Howard. "We know that there are many leading companies and governments dedicated to meeting or exceeding those targets. By bringing the key players together for the first time, we believe that the world can turn the corner on climate change."

The Group intends to hold conferences and meeting around the world and to publish an annual 'climate index', allowing organisations to examine best practice actions aimed at reducing emissions. There is also talk of establishing a 'carbon university' next year, to become a centre of learning for organisations.

GE wind turbines for projects in Taiwan and France

GE Energy has been selected as the turbine supplier for the first large-scale wind power project in Taiwan, and is also supplying 30 wind turbines for two projects in France that will total 45 megawatts of new wind power capacity.

The 39 MW project in Taiwan is part of a 10-year plan by Taiwan Power Company (Taipower) to promote wind energy in accordance with the government's goal to increase the use of renewable energy and reduce carbon dioxide emissions.

GE will provide 26 of its 1.5 MW wind turbines through Chung-Hsin Electric & Machinery Manufacturing Corporation of Taiwan, the turnkey contractor for the project. The machines will be installed at three locations: three turbines at the Third Nuclear Power Station on the southern end of the island, three turbines at the Tah-Tarn Power Station and the remaining 20 turbines along the Tao-Yuan Kuan-Yin coastline. The latter two sites are on the northwestern coast, about 100 km south of the capital city of Taipei.

Once completed, the overall project is expected to generate about 100 GWh annually.

In France, GE Energy is supplying turbines that will represent an increase of nearly 20% in the country's installed wind capacity. In 2003, France increased its capacity for wind-generated electricity by 91 MW, bringing the total installed capacity by the end of the year to 239 MW. The French government is supporting wind power development with fixed tariffs for wind-powered electricity.

For the first project, La Haute Lys, GE is providing 25 1.5 MW wind turbines. This project, involving four wind farms, is one of the first large French installations of wind turbines and is located in five municipal areas in northern France: Fauquembergues, Renty, Audincourt, Reclinghem and Vincly.

For the second project, Sortosville-Les Beaumont, GE is supplying five 1.5 MW turbines. The project is located in the Cotentin area on the west coast of France. Both of the new projects will supply power to Electricité de France, the French national electricity supplier.

'World's largest mine gas project' in the Ukraine

What is described as the largest coal mine gas-to-energy project in the world in terms of total power output, currently being built at the Sasyadko coal mine in the Ukraine, will employ 22 complete gas engine cogeneration systems from GE Jenbacher. Each system will include a cooling system, silencer, control system and heat recovery unit.

Coal mine gas will power 22 GE Jenbacher JMS 620 GS-SLC cogeneration systems to generate 131 MW of electrical and thermal output. The heat and power will support operations at three Sasyadko sites inside and near Donetsk, southeast Ukraine.

The Sasyadko project will prevent the release of methane gas that

Higher oil prices 'damage world economies' – IEA

Oil prices still matter to the health of the world economy. Higher oil prices since 1999 – partly the result of OPEC supply-management policies – contributed to the global economic downturn in 2000-2001 and are dampening the current cyclical upturn, according to a new report from the International Energy Agency (IEA): *Analysis of the impact of high oil prices on the global economy*. World GDP growth may have been at least half a percentage point higher in the last two or three years had global oil prices remained at mid-2001 levels, says the IEA.

Fears of OPEC supply cuts, political tensions in Venezuela and tight stocks have driven up international crude oil and product prices even further in recent weeks. By March 2004, crude prices were well over \$10 per barrel higher than three years before, says the Agency.

Current market conditions are more unstable than normal, in part because of geopolitical uncertainties and because tight product markets – notably for gasoline in the US – are reinforcing upward pressures on crude prices. Higher prices are contributing to stubbornly high levels of unemployment and exacerbating budget-deficit problems in many OECD and other oil-importing countries adds the IEA.

The vulnerability of oil-importing countries to higher oil prices varies markedly, depending on the degree to which they are net importers and the oil intensity of their economies. According to research carried out by the IEA, a sustained \$10 per barrel increase in oil prices from \$25 to \$35 would result in the OECD as a whole losing 0.4% of GDP in the first and second years of higher prices. Inflation would rise by half a percentage point and unemployment would also increase.

The OECD imported more than half its oil needs in 2003, at a cost of over \$260 billion – 20% more than in 2001. Euro-zone countries, which are highly dependent on oil imports, would suffer most in the short term, their GDP dropping by 0.5% and inflation rising by 0.5% in 2004. The US would suffer the least, with GDP falling by 0.3%, largely because indigenous production meets a bigger share of its oil needs.

The adverse economic impact of higher oil prices on oil-importing developing countries is generally even more severe than for OECD countries, says the IEA. This is because their economies are more dependent on imported oil and more energy-intensive, and because energy is used less efficiently. On average, oil-importing developing countries use more than twice as much oil to produce a unit of economic output as do OECD countries.

would otherwise have been vented into the atmosphere. The cogeneration systems will consume coal mine gas, which contains at least 25% methane, a gas with a global warming potential 21 times greater than that of carbon dioxide. At the Sasyadko sites, the total reduction will equate to approximately 2.3 to 2.7 million tonnes of carbon dioxide per year.

The equipment is being manufactured at GE Jenbacher's facilities in Jenbach, Austria and will be delivered to Sasyadko in 10 stages, beginning this month. The facilities are expected to begin commercial operation no later than the fourth quarter of the year.

Australia launches plan for cleaner coal

The Australian Government has launched a comprehensive plan for reducing, or even eliminating, greenhouse gas emissions from the use of coal in the country's power generation industry.

The 'COAL21 National Action Plan' has been developed over the past year as part of a collaborative partnership between the federal and state governments, the coal and electricity industries, and research organisations, aimed at reducing greenhouse gas emissions from the use of coal.

The Action Plan identifies a number of emerging technologies that hold the key to reducing or eliminating emissions from coal. These include technologies to capture carbon dioxide emissions from power stations and permanently store them in underground geological structures – a strategy that the Plan identifies as the pathway to achieving near zero emissions from coal.

Other priority technologies include ones that increase the efficiency of coal use and others such as coal gasification that may allow coal to one day provide large amounts of hydrogen gas.

Speaking at the launch, Chair of the COAL21 Steering Committee, Tim Besley, said that solving the problem of greenhouse gas emissions will require major changes in the way Australia produces and uses energy. "Renewable forms of energy may well prove to be the long-term solution, but it will be many decades or longer before these become a significant part of the generation mix. The measures outlined in the Action Plan for reducing emissions from coal therefore complement efforts to increase the uptake of renewables and reign in rapidly growing energy demand through measures to increase end-use efficiency", he added.

World energy use 'to grow by 54% by 2025' – US DOE

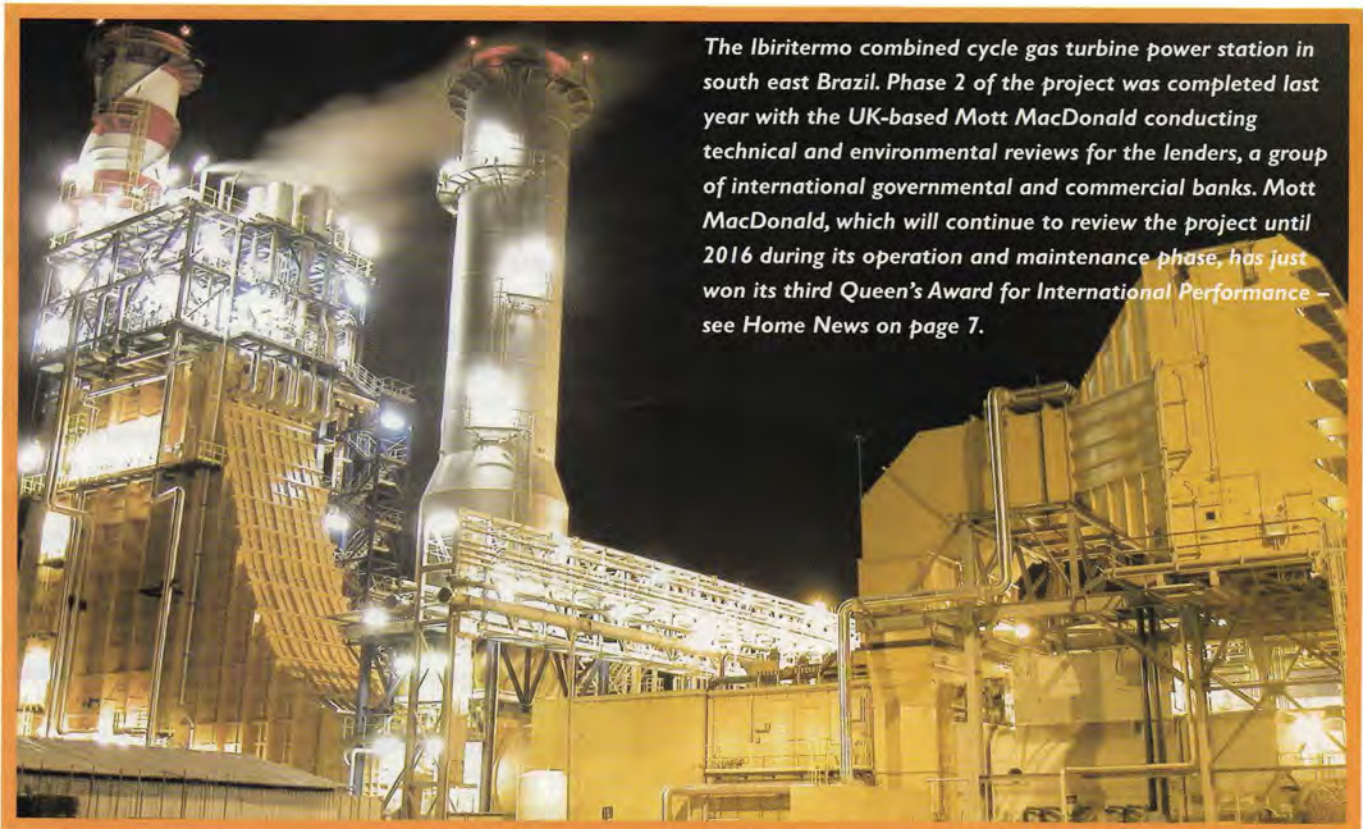
Strong growth in energy use in developing nations – particularly in Asia – is forecast to drive world energy use up by 54% by 2025, according to the US Department of Energy's Energy Information Administration (EIA). The EIA's *International Energy Outlook 2004* projects a 91% increase in energy use in developing countries between 2001 and 2025. In contrast, energy use in the industrialised countries is expected to grow by about 33%. Emissions of greenhouse gases are also projected to rise considerably.

The projected growth rates are slightly lower than those published last year, when the agency projected a 56% growth in world energy use by 2025.

The EIA projects the increased energy demand to cause oil production to increase by 57% by 2025, accompanied by a 67% increase in natural gas production, a 51% increase in coal production, and a doubling in worldwide electricity use.

The report also projects a 57% growth in renewable energy over the same time period, which means that renewable energy will continue to hold about the same share of the world's energy market in 2025.

However, the EIA noted that its projections would change if government policies and programmes to reduce greenhouse gas emissions are established. Under the current scenario, emissions of carbon dioxide increase by 55% by 2025.



The Ibiritemo combined cycle gas turbine power station in south east Brazil. Phase 2 of the project was completed last year with the UK-based Mott MacDonald conducting technical and environmental reviews for the lenders, a group of international governmental and commercial banks. Mott MacDonald, which will continue to review the project until 2016 during its operation and maintenance phase, has just won its third Queen's Award for International Performance – see Home News on page 7.

Government publishes first annual report of Energy White Paper

Four major reports on energy matters were published by the Government in April: the first annual report of the Energy White Paper: *Creating a Low Carbon Economy - the First Annual Report*, *Energy Efficiency - The Government's Plan for Action*, the *Government's Strategy for CHP to 2010*, and the Government's second annual report on the UK's Fuel Poverty Strategy.

The much-awaited annual report, published as part of the work of the Sustainable Energy Policy Network, itself established by the White Paper, re-affirmed the Government's commitment to the four objectives set out in the original White Paper, to cut carbon dioxide emissions, maintain reliable energy supplies, promote competitive energy markets and ensure homes are affordably heated.

Some of the achievements listed by the Government include:

- the UK's first major offshore wind farm at North Hoyle off the North Wales coast started generating electricity last November;
- 1.6 GW of renewables projects have received consents and two more gigawatts are in the pipeline;

- an agreement between the UK and Norway announced in October 2003 has cleared the way for the construction of a new pipeline capable of delivering 20% of our annual gas demand;
- research has confirmed the UK has the most competitive gas and electricity markets of all the European Union and G7 nations; and
- energy efficiency programmes are making an increasing impact on fuel poverty and the Government has assisted over 750,000 vulnerable households in England through the Warm Front programme alone.

Plans for a step-change in energy efficiency to boost efforts to tackle climate change and save more than £3 billion a year on energy costs were unveiled by Environment Secretary Margaret Beckett. *Energy Efficiency - The Government's Plan for Action* set out how the government aims to cut carbon emissions by an extra 12 million tonnes through energy efficiency within the next six years.

Key measures in the energy efficiency plan include:

- a new aim to save 4.2 million tonnes of carbon from households by 2010; and
- double the level of Energy Efficiency Commitment activity from 2005 to 2011, subject to a review in 2007.

The plan strengthens government-wide efforts to improve energy efficiency, including changes to Building Regulations that will raise standards of new and refurbished buildings in 2005. Meanwhile, the new EU emissions trading scheme and Climate Change Agreements will help to ensure that the most energy-intensive industries and power generators have incentives to reduce emissions in the most cost-effective way, says the DTI. The Decent Homes programme will continue to improve energy standards in social housing, while fuel poverty programmes tackle heating and insulation standards in the homes of those least able to afford to keep warm.

On the CHP strategy, Mrs Beckett added: "CHP has an important role to play in achieving our Energy White Paper goals. We must continue to aim for our target of 10 GW of good quality CHP capacity by 2010. We want to provide a framework in which business can plan long-term investment decisions with greater certainty. This strategy document does that."

The CHP Association disagreed, suggesting that the Government had acknowledged that it will fail to achieve its manifesto commitment of 10 GWe CHP target by 2010. CHPA Director David Green said: "We welcome the publication of the Government's CHP Strategy. But it has taken seven years to deliver, during which time the market conditions created by the Government have taken the CHP sector from a healthy and dynamic industry to one near collapse, putting both the UK's security of supply and its leadership on the climate change agenda at risk."

Lastly, the Government's second annual report on the UK's Fuel Poverty Strategy was published jointly by the DTI and DEFRA. The latest Government estimates show that the number of vulnerable, fuel-poor households in the UK has fallen from about 4 million in 1996 to an estimate of around one and three-quarter million in 2002.



Part of the Greenwich Millennium Village, winner of the 'Andy Swan New Build Award' sponsored by the Insulated Render and Cladding Association for the best use of external wall insulation in new buildings. The Millennium Village is on the riverbank, alongside the Millennium dome on the Greenwich peninsula. The project needed to comply with Government requirements for innovative construction of low-cost affordable flats and housing. Steel-framed construction was specified, coupled with 7,000 m² of insulated render.

The wall was built up using two sheets of plasterboard on the internal face; 150 mm stud infilled with acoustic quilt in the void; and the Sto Ltd external wall insulation system. This comprises sheathing board with 50 mm of StoTherm mineral wool insulation which, together with the quilt, met the target U-value. Finally is an acrylic finish in panelised strong blocks of colour. To comply with NHBC requirements it was necessary to incorporate a 20 mm drainage gap between the sheathing board and the insulation.

Energy companies win Queen's Awards

Several UK companies from the energy and power related sectors have won a Queen's Award for Enterprise this year, including:

- Ampy Automation Digilog Ltd – a manufacturer of intelligent electricity meters which are providing a breakthrough in domestic electrification in Italy and elsewhere;
- Energy Institute member Combustion, Energy and Steam Specialists (CESS) Ltd – a small energy consultancy specialising in the sourcing, valuation, marketing and relocation of surplus power plant, based in the Orkney Isles;
- Dulas Ltd – a long-established specialist in renewable energy technologies, including solar-powered vaccine fridges for the developing world;
- Energy and Power Consultants Ltd – an engineering and project management consultancy providing services to major energy projects;
- Somar International Ltd – a young company which makes 'Powerboss' energy saving motor controllers which are marketed in 75 countries;
- AN Technology Ltd – a designer and manufacturer of nuclear measurement systems for nuclear safeguards, waste and radiation measurement; and
- Mott MacDonald – the UK-based international consultancy with a significant power industry business.

A Queen's Award for Enterprise is a prestigious endorsement of business success and best practice. Winners enjoy a reception at Buckingham Palace and an Award presentation at their own premises by a representative of The Queen.

Visit resource04 at the BRE next week

In the first trial of its kind in the UK, a fuel cell CHP system developed by Scottish-based Smart Energy Ltd will be trialled in a test house at the BRE's Watford site as part of the 'resource04' event – an exhibition of renewable and innovative energy efficiency technologies for buildings being held at the BRE on 7–10 June. The event is co-sponsored by the Energy Institute.

In the fuel cell trial, funded by the Carbon Trust, an alkaline fuel cell CHP system (with lead acid battery energy storage) will supply electricity to one of BRE's unique full-scale test houses, which mimics the requirements of a real home with a range of simulated occupancy patterns. Heat produced by the unit will augment the house's gas-fired central heating system.

The four day event comprises conferences on renewables and low carbon technologies, together with an exhibition, technology demonstrations and some large outdoor demonstrations that could only be staged at the BRE.

Book online at: www.resource04.com



The Land Registry Wales office building in Swansea boasts a new digital lighting management system from Ex-Or Ltd which, says the company, automatically delivers optimum lighting conditions to match the use of space. The Land registry is also benefiting from electricity cost savings of around 65% of its previous consumption, following installation of the system.

The project involved removing existing luminaires that provided poor lighting and afforded no control over light levels or hours of use. Ex-Or installed an integrated system of high frequency regulating luminaires controlled by the EX-Or Digital MLS System. Using communicating presence detectors with each luminaire, information on the state of occupancy within the building is shared between luminaires. Integral digital detectors also provide individual luminaires with daylight regulation. Luminaires now automatically dim and brighten, or turn on and off according to need.

BNFL reduces Sellafield discharges

Discharges of radioactive technetium-99 (Tc-99) into the Irish sea from the BNFL plant at Sellafield are to be reduced by 90% following the implementation of a new waste treatment technique, say the Environment Agency and the Nuclear Installations Inspectorate (NII) of the Health and Safety Executive.

The Environment Agency required BNFL to carry out work towards reducing Tc-99 discharges to sea and has worked closely with the NII, BNFL and Nirex towards implementation of the technique. A trial was carried out late last year which involved the use of TPP (tetraphenylphosphonium bromide) to remove Tc-99 from liquid waste, known as medium active concentrate (MAC), at Sellafield. The Agency and the NII have assessed the outcome of the trial and BNFL will now begin implementing the new technique with immediate effect.

The reduction of annual Tc-99 discharges into the Irish Sea from Sellafield will result in lower concentrations detected in the marine environment. The reduction in discharges will lead to a reduction in radiation exposure by up to 28 microsieverts per year – about 10% of the radiation exposure from all liquid discharges, says the Agency.

Onshore wind projects for Wales, Cornwall and Lancashire

Construction work has begun on the Cefn Croes wind project in Wales, which has recently been acquired by Falck Renewables Limited, the wind energy subsidiary of the Falck Group of Italy. The project was co-developed by the Renewable Development Company (RDC) of Mold, Wales and GE Energy, with turnkey construction, wind turbine supply,

operation and maintenance services being provided by GE Energy.

Located near Devil's Bridge, approximately 15 km east of Aberystwyth, the project will use 39 GE 1.5 MW turbines. Once completed in October, Cefn Croes will add 58.5 MW of new renewable capacity. The project's power will be sold to the Non-Fossil Fuel Purchasing Agency and distributed to the national grid.

From its earliest planning stages, the project, one of the largest single investments ever made in the Ceredigion area of mid-Wales, has been designed to provide significant local benefits, says GE. Project developers estimate that £9 million of local Welsh contracts will be made available through project construction, with about £5 million to be sourced in mid-Wales.

Meanwhile, planning approval has been granted for wind schemes in Cornwall and Lancashire planned by National Wind Power. Roskrow Barton Wind Cluster, located 3 km north-west of Falmouth, Cornwall will consist of two 850 kW wind turbines, whilst Hameldon Hill Wind Cluster, situated 5 km south-west of Burnley, Lancashire will comprise three 1.3 MW turbines.



Photomontage of the Hameldon Hill Wind Cluster near Burnley

Scottish Coal to establish tree nursery

Scottish Coal is to move into biomass – the company has announced plans to launch Scotland's first willow tree nursery near Vogrie Estate Country Park, Gorebridge in Midlothian. The company sees the growing of energy crops potentially creating several thousand jobs in Scotland over the next ten years, provided that industry, central government and local authorities can work together to realise this aim.

Due to open this summer on a 15-hectare site, the Chesters Wood Energy Plantation will be home to up to 0.5 million willow seedlings, which will be brought on for transplanting to willow coppice plantations across Scotland.

The trees yield a biomass energy crop every three to four years, which is chipped or baled then processed as a biofuel, used on its own or mixed with coal as a combi-fuel for electricity or heat generation.

Dacre Purchase, Development Director, commented, "UK electricity generators are crying out for biofuels to meet their commitments under Renewables Obligation rules. Scotland's private and public sectors need to work together to deliver energy crops on a serious scale or overseas growers will grasp the opportunity from Scotland."

Purchase added, "We believe it's vital for Scotland to have a mix of strategic energy sources for the future. We cannot afford to create an over-reliance on gas, for which Scotland will shortly be at the mercy of overseas suppliers."

As the UK's second biggest coal producer, the company says it already has the bulk handling skills and transport network in place to take energy crops from field to feedstock for power generation.



Part of a new micro-scale water mill hydropower project located in south Somerset, where 10 historic water mills will generate enough hydro-electricity to supply 150 homes in the area, with surplus energy sold back to the power companies. Led by the South Somerset District Council and part-funded by the Energy Saving Trust's Innovation Programme, the mills will produce over 600 MWh of electricity per year and reduce carbon dioxide emissions by 260 tonnes.

Gants Mill, near Bruton, was the first to generate electricity – the other mills will come on stream by summer. With at least 20,000 disused mill sites in the UK, there is vast untapped potential to harness river and stream power to help meet Government renewable energy targets, says the Council. The south Somerset project showcases how local authorities and their communities can work together to combat climate change.

Universities collaborate on cheaper solar power

Two of the North East's universities are to play a key role in Britain's largest ever solar cell research programme – as members of a consortium that has been awarded £4.5 million for a project they hope will help to cut the cost of solar cells by half.

Northumbria and Durham Universities will be spending the next four years conducting research into the development of solar cells which they hope will not only increase the efficiency of the cells to help generate more electricity, but will also lead to substantial reductions in the production cost.

The universities are working with Bath, Loughborough, Bangor and Southampton Universities, with funding from the Engineering and Physical Sciences Research Council, on the Supergen Initiative. This will focus on three key materials used in the production of the solar cells – crystalline silicon and the compound materials of copper indium gallium diselenide (CIGS) and cadmium telluride.

Each university is concentrating on a different aspect. Durham is looking into the efficiency loss of solar cells and the properties of materials, while the Northumbria team is working on the thin film components that absorb and conduct the solar power. Northumbria University is already the home of one of Britain's earliest large-scale PV installations.

It is hoped that, at the end of the four-year project, researchers will have identified the most efficient cell designs that can be easily and cheaply produced on a commercial basis.

Longer-term energy service deals for householders

Energy regulator Ofgem has finalised details of a Government pilot initiative which will give up to one million households the opportunity to sign longer-term contracts with energy suppliers. These new-style contracts will also provide consumers with energy efficient products and services from their supplier, such as efficient boilers and domestic appliances, low-energy light bulbs and house insulation.

Philip Sellwood, Chief Executive of the Energy Saving Trust, said the trial of longer-term energy contracts would be mutually beneficial for consumers and energy providers: "The pilot will offer a real incentive for energy suppliers to provide more energy efficient measures such as cavity wall insulation and condensing boilers to their customers. Consumers should look out for these new offers which will be available from suppliers later this year, when the pilot initiative begins."

The average household can cut £200 off energy bills by introducing cost-effective measures throughout the home. The average consumer can save up to £100 a year on their annual energy bill by installing cavity wall insulation, says the Trust. While changing to the cheapest energy supplier can make similar savings, this is not a long-term solution – insulating cavity walls will keep energy bills down permanently and reduce the amount of energy wasted every week.

Researchers at Durham will join those at Northumbria



Working in London to cut fuel poverty

The London Energy Partnership has welcomed action by energy provider EDF Energy to tackle fuel poverty in London. The company has pledged £9.5 million to eradicate fuel poverty in six London boroughs, in a move which comes as energy provider Powergen has just extended its energy savings HeatStreets scheme to west London.

EDF Energy is to expand its 'energy efficiency Warm Zone' scheme which operates in Newham to a further six London boroughs. This involves offering energy efficiency assessments to homeowners and providing investment for energy saving measures, such as cavity wall insulation and loft insulation.

In the company's first warm zone, which operates in partnership with the London Borough of Newham, 57,000 homes have been given energy efficiency assessments and among them, 8,500 qualified for investment by EDF Energy, Warm Front and the local authority. The majority of the investment has been in improvements, such as cavity wall insulation or loft insulation.

Through its retail-arm, London Energy, and previously through its former name of London Electricity, the company has invested more than £34 million in London on energy efficiency projects over the past nine years. This investment has helped reduce fuel bills by insulating over 73,000 homes, providing 3.27 million low energy light bulbs and providing 256,000 energy saving appliances, says EDF.

A new, facilities management

After substantial expansion during the 1990s, the contract energy management (CEM) market appears to have stuttered a little in recent years. Annual turnover is estimated by the Energy Systems Trade Association to be in the region of £500 million, with demand for CHP having flattened out. However, facilities management (FM) company George S Hall believes that the time is now right to convert the positive climate for energy efficiency into hard business and has recently launched its entry into the CEM marketplace.

Here, Chris McLain explains why FM providers with energy expertise are in an ideal position to ensure CEM makes a bigger impact in the commercial sector. He argues that their central responsibility for premises management, including a broad range of activities responsible for the bulk of energy consumption, allows FM providers to implement a 'best practice' approach to energy efficiency.

By Chris McLain,
Managing Director for
Energy, George S Hall

There is no doubt that a combination of national government policy, EU legislation, commercial pressures on business to reduce overheads and an energy market with rising prices have come together to put energy performance under the microscope. And it is not a moment too soon. The Carbon Trust estimates that every year about £12 billion worth of energy is wasted in the UK – almost a third of our total consumption. Furthermore UK building stock is estimated to be responsible for at least 30% of carbon emissions. A driver is needed to spearhead better energy management – now there are three.

The Government's Energy White Paper is focused on creating a low-carbon economy. Already it has set itself the target of reducing carbon dioxide emissions by 20% on 1990 levels by 2010 and implemented a range of measures designed to make energy performance a commercial priority. The Climate Change Levy is intended to encourage firms to use energy more efficiently, with revenues originally returned to business through reductions in National Insurance contributions. Incentives to take life-cycle costing more seriously have also been introduced in the form of Enhanced Capital Allowances for energy efficient equipment.

Due to be implemented in January 2006, The EU Energy Performance of Buildings Directive (EPD) will force a rethink of the way buildings are operated. The EPD covers businesses, the public sector and homes. Measures include: setting minimum standards for building work on new and existing buildings, reviewing building standards at least every five years, introducing energy certificates for all buildings to assess their efficiency and testing the performance of boilers and air conditioning systems in commercial and business premises. These last two items are fundamental – it means that energy efficiency will finally be enforced.

Ironically, despite this welter of legislation, the catalyst for achieving greater energy performance could be the energy market itself and a perceived imbalance between supply and demand, leading to higher energy prices. As soon as energy costs are seen as the difference between slim margins and no margins at all, energy will become a Board level issue. In this situation, facilities management (FM) providers should be in a position to step in with energy solutions that help improve the bottom line.

The contract energy management market

In his response to the Government's energy policy consultation process in late 2002, Alan Aldridge,

Executive Director of the Energy Systems Trade Association (ESTA) commented: "Support should be provided to the contract energy management sector to vastly increase the number of sites where energy management and control are 'contracted out' to organisations that can and do provide the required focus, investment, expertise and resource to improve energy efficiency." He went on to say, "The commercial offices sector is the fastest growing area for energy consumption. Interestingly, it is also the largest growth area for CEM, but this success currently represents only a tiny fraction of the offices' estate."

So what types of external organisations are in a position to make this happen? Who is going to start delivering CEM growth combined with energy efficiency performance? There appear to be three main sources of supply:

Heat service contracts

Here, energy service companies (ESCOs) are responsible for supplying energy to site, charging for energy on the basis of the amount received. There is little incentive for investment in end-use efficiency.

Shared savings contracts

Here the ESCO takes responsibility for the client's energy bills – the latter pays an agreed percentage of costs prior to the CEM contract. There is some possibility of shared savings above an agreed ceiling. Contracts frequently involve an investment in CHP.

Fixed price contracts

Similar to shared savings contracts, except clients receive a fixed amount of energy savings according to the agreement. The contracts usually involve the installation of building energy management systems and have mainly been developed by traditional FM companies.

Of these three routes to market, the FM route based on fixed price contracts appears to offer the most potential. Since deregulation in 1994, there has been a gradual shift in the CEM market from simply procurement and tariff negotiation to energy conservation. The involvement of FM providers from an M&E background is a natural development.

Participation in contract energy management allows FM providers to leverage their engineering expertise in areas like: monitoring and targeting, energy management systems, energy audits, equipment installation, operation and maintenance, and capital investment based on life-cycle assessment. Furthermore, it complements a trend within the FM

ent approach to CEM

industry towards multi-service contracts, as end-users place greater emphasis on standardised service providers and a single point of contact.

Filling a gap in the marketplace

After taking soundings from end-users, GSH is convinced that, faced with rising energy prices and the Climate Change Levy, businesses are seeking to reduce their utility costs. They are aware that future legislation will put even greater pressure on them to improve energy efficiency. The only way to save money is to save energy! They know the potential is there to improve energy efficiency and they see it as a role that falls within the FM compass. The three primary objectives are:

- guaranteed energy savings;
- budget security; and
- no cost to the client.

It became clear to GSH that a new approach to contract energy management was needed and that its logical home was within a complete FM package. Traditional benefits such as fixed cost utility supply, no property risk and property investment should be maintained. Client bugbears like long-term restrictive contracts, termination penalties and plant change of ownership must be removed.

Known as 'energyplus', the new service complements corporate environmental policies and reduces pollution through maximised efficiency, as well as lowering the impact from the Climate Change Levy. End-users will benefit from fixed reduced costs, agreed in advance, and the risk of excess consumption is transferred to GSH.

As opposed to energy reduction measures undertaken on an 'ad-hoc, quick win' basis, the service is underpinned by metering, performance reporting and waste analysis in a sustained manner to reduce consumption long-term. The aim is to match energy usage with building profile to ensure that the premises it manages conform to documented best practice. This is exactly the type of focused approach to contract energy management that ESTA was calling for in 2002.

CEM in practice

So does this approach work? Recent successful examples in the United States include The Gale Company, one of the country's leading real estate and investment services companies. Negotiations, which began over three years ago, resulted in the initial award of three pilot buildings in 2002. In 2003, an additional 21 buildings were added to the portfolio.

GSH sites now include buildings in New Jersey, Illinois, Michigan and New York with significant returns resulting from the guaranteed energy savings programme.

'Energyplus' is characterised by professional energy management and optimised preventative maintenance with capital investment in plant installation paid for by the provider. The process commences with a building energy audit carried out by a process of desk research, whereby historical bills, equipment and occupancy profiles are subject to comprehensive analysis. Secondly, an overview of site activities is undertaken to identify 'energy hungry plant' and improve housekeeping. Fixed reduced costs are agreed in advance and the risk of excess consumption transferred to the FM supplier.

Closer to home, the Sheraton Amsterdam Airport Hotel and Conference Centre has recently chosen to add GSH energyplus to its existing three year FM agreement. What makes this interesting is that, even in a five star facility where quality is at a premium, GSH can still guarantee its standard minimum 5% pa energy consumption savings without affecting the comfort of visitors.

In conclusion

The reality is that GSH's approach is not new, but has some new benefits. Sound contract energy management is about implementing best practice on a day-to-day basis. But timing is everything and with increasing regulation, overheads under pressure and prices rising, this is the right approach at the right time.

The advantage for an FM company holding a central position at the hub of the building management process is that taking on a new responsibility actually reduces the overall end-user administrative burden. Coming from an M&E background, the relevant engineering expertise is already available in-house. And consumption savings can be guaranteed because it is proven that a more disciplined approach will deliver improved energy performance.

Perhaps the hardest problem in the past has been convincing prospective customers that contract energy management isn't 'too good to be true'. Once the business model has been explained, including budget security and the element of risk transfer to the provider, the next question was always – 'where's the catch'? The reality is that there isn't one and the difference now is end-users cannot afford to leave CEM in the pending tray.



GSH provides a full range of FM services to the New Jersey Transit Authority under a five year contract based at the company's Newark headquarters building.

Contact Chris McLain
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or via the website:
www.gshgroup.com

Businesses beware of rising

After buyers getting used to largely falling energy prices over the last few years, the situation in the UK energy market has now changed radically. Prices in the UK have risen continuously over the last two years, a trend which looks set to continue for the foreseeable future. Here, utility consultant McKinnon and Clarke looks at recent price trends and suggests methods that businesses could use to win the best deals – including outsourcing of utility purchasing.

Many companies are unaware of the extent of damage escalating costs could have on their business. Now, more than ever it is crucial to consider the options available when it comes to purchasing of utilities.

UK electricity market

With the recent instability and generally upward trend of UK wholesale electricity prices, now is a good time to look at the underlying drivers behind future pricing and predictions of future price movement. Figure 1 summarises recent electricity price history.

NETA (New Electricity Trading Arrangements) was introduced in 2001 and moved electricity wholesale pricing much closer to the unstable commodity style tracking of the oil and gas markets. This has resulted in greater uncertainty, higher volatility and quicker reaction to market factors. Initially, wholesale prices dropped by 40% but, since April 2002, this reduction has more than reversed.

Market sources are virtually unanimous in predicting a continuation of rising electricity prices. The instability of the electricity market can be attributed to several factors, the most salient of these being:

- changes in short or longer term external demand, such as that from continental Europe;
- plant outages or mothballing (scheduled or unscheduled) leading to countrywide capacity margin concerns;
- market sentiment (whether based on 'real' factors or nervous traders);
- financial collapse of, or difficulties experienced by, major players in generation and supply (eg Drax, TXU, British Energy, Independent Energy); and
- new environmental taxes and levies, and the evolution of understanding as to their effects over time.

In conclusion, more and more factors lend support to the view that not only is the new volatility in the

market here to stay, but so are recent price increases and we are more likely than not to see even higher energy costs in future.

UK gas market

The risks for rising gas prices aren't that different. During 2003, prices increased over the summer/autumn months. Many arguments were raised as to what were the main driving factors for the curve, ranging from:

- geopolitical events such as the conflict in Iraq;
- various storage, capacity and field outage issues;
- the influence of the increasing forward electricity prices; and
- the weather.

As to the future, it is anticipated that the UK will shortly be moving from its current position as a gas exporter to a net importer. The opening of the UK-Zeebrugge interconnector in October 1998 strengthened the link between gas and oil prices, by joining the UK gas market with the heavily oil-associated continental gas market.

Once we reach this point we might anticipate greater competition as gas from Russia, Norway and The Netherlands enters our market. As to the influence this will have on prices we can only speculate at this stage. Indeed it may result in UK rates mirroring the European market even more closely. Figure 2 summarises recent gas price history.

UK oil market

The story for the fuel market is very similar, with oil prices having risen steadily over the last few years, hitting an all time high recently. Again these rises can be attributed to a number of factors, but nothing more so than unrest in the Gulf region. Figure 3 summarises recent oil price movements.

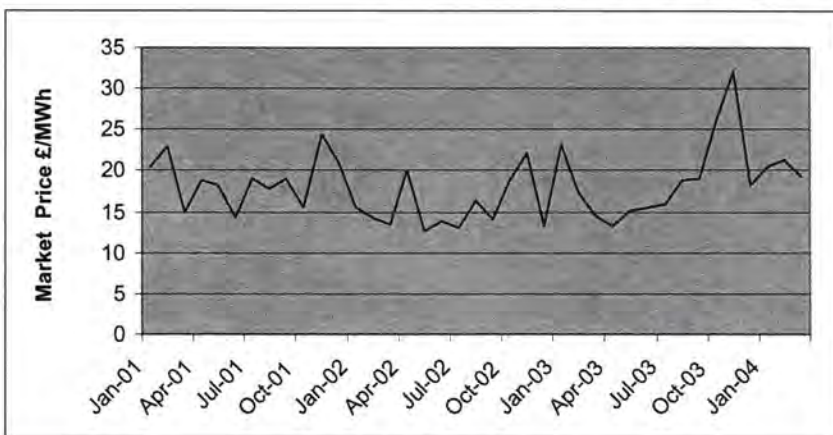
Rising oil prices have pushed up costs for manufacturers according to official figures, the worrying part is most manufacturers are not in a position to pass these increases on.

The US presidential election may be the only area of hope in the short term. US petrol prices are at an all time high and, with the summer driving season approaching, Mr Bush will want to see oil prices taking a downward turn. Saudi Arabia has already suggested that it wants to see oil prices between \$22 and \$28 per barrel.

Environmental levies

In terms of the environment, national governments and

Figure 1. Recent market electricity prices (baseload day ahead prices)



g energy costs

the EU are placing ever-greater emphasis on the need to tackle pollution and climate change, with the result that new levies and environmental taxes are being created constantly. Some are directly passed through to customers, others are borne by suppliers, in theory, but in all cases are reflected in higher wholesale prices to the end user.

How does all of this affect business in the UK? As the long-term trend for energy prices in the UK is apparently upward, timing is everything when it comes to purchasing of utilities. Businesses need to identify the optimum time to buy and then to move quickly to take advantage of situations that could be financially beneficial to them.

Delaying negotiations until renewal dates is no longer a wise option. Companies must find ways of keeping on top of developments in the energy market; this includes monitoring of the commodity markets in order to determine the optimum purchasing time.

A number of solutions are available and, while some seem obvious, others may not be as clear-cut.

The first option is for someone in house to look at switching suppliers. This can take a bit of time and effort but can be a simple and effective way of cutting costs at a stroke. However, the downsides are that this is time consuming and, without extensive research and market knowledge, the best price cannot always be guaranteed. Another option is to look at energy efficiency; there's no point in getting the best possible price for electricity if the overall use is not being controlled efficiently. This is where energy managers can come unstuck.

Managers with the responsibility for energy generally have multiple roles within an organisation and may also be responsible for facilities management/financial issues within the company. Each of these duties is time consuming and requires specific knowledge that can often mean that energy effectiveness is bottom of a very long list.

Outsourcing

Considering outsourcing of energy solutions therefore can be beneficial; and there are two main methods of going about this.

One option is to use an energy broker to source an alternative supplier. This may seem very attractive at first, as very often their services involve no direct charges as their fees are paid by the suppliers. Normally, once the supply contracts are negotiated then the relationship ends until the next

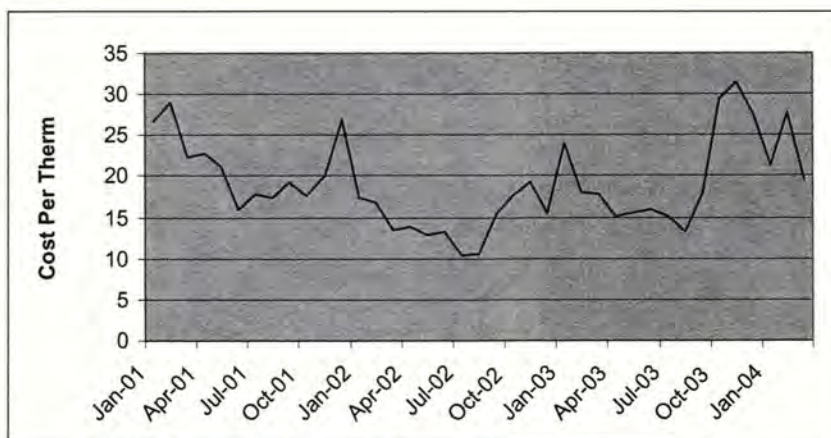


Figure 2. Recent market gas prices (gas NBD day ahead price)

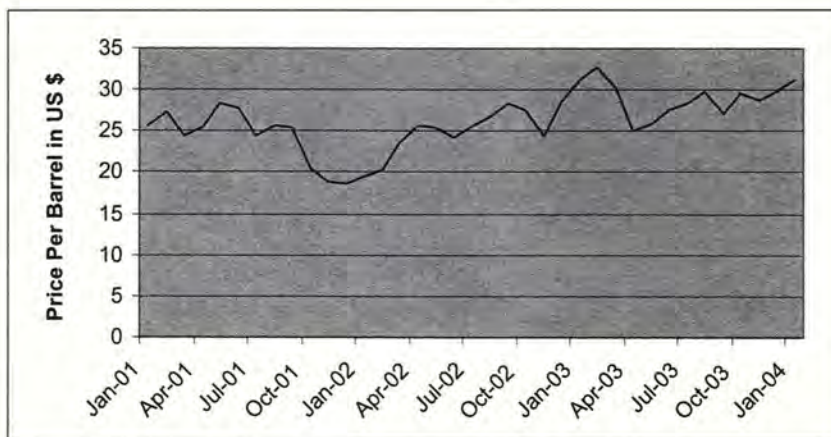


Figure 3. Recent market oil prices (Brent crude)

contract round.

A second option is to use the services of a full service utility consultant (such as McKinnon & Clarke). M&C is completely independent of the suppliers, so the full implications of a change of supplier are evaluated. M&C's continuous monitoring service ensures that after the contract has been placed the benefits are fully realised. Anyone with any experience of changing supplier will know that this can be a big issue and, if bills are issued incorrectly, then the time taken to correct matters can quickly erode any financial gains.

M&C's Energy Services division undertakes detailed energy surveys of client sites, identifying interesting and innovative energy saving projects. The identified savings are presented to the client as an estimated financial saving. Following client authorisation these recommendations are implemented by M&C and the true financial value of the saving is reported back to the client on a monthly basis.

Contact McKinnon & Clarke at email: enquiries@mckinnon-clarke.com or via the website at: www.mckinnon-clarke.com

Technology-driven energy

The reasons why companies need to be more energy efficient are piling up: Climate Change agreements, UK emissions trading scheme and the Climate Change Levy. Now on the near horizon is the EU Emissions Trading Scheme (January 2005) and the new EU Energy Performance of Buildings Directive (January 2006), which will introduce energy certification for buildings. This will further develop competition to achieve a better building performance. And the incentive to meet this legislation is a publicly rated building, giving full exposure to the inefficiencies of its owner or management team.

Now is the time, argues Alan Aldridge, to broaden the use of automatic monitoring and targeting (aM&T), a relatively low technology process, applicable from the smallest to the largest energy user, that really works.

*By Alan Aldridge,
Executive Director of
ESTA*

At virtually all sites, identifying and eliminating energy waste will bring as much, if not more, energy/cost savings than could be achieved in investing in new efficient plant. To achieve these savings requires a structured and disciplined approach based on sound, accurate and timely measurement of energy consumption and the ability for energy managers to access and use this information easily.

The ESTA proposition is that users, including under 100 kW users, should move towards the automatic collation and analysis of data. Users will find the consumption and other profiles derived from the returning data of great benefit. They will be able to identify not only plant that is performing poorly and may need immediate maintenance or even replacement, but also the much harder task of identifying and correcting operational and management procedures that inherently produce energy waste.

The evolution of 'automatic' monitoring & targeting (aM&T) has much to do with the technical developments that have made it a sound business option.

Automatic technology

Over the years, the increasing simplicity of meter design has led to ease of installation. Their technological development has seen the arrival of network connections, local data storage and wireless communications. Linked to IT processes, including web-enabled systems, and the once humble meter now has the capability to become but one component of a highly sophisticated and fully integrated building performance management system.

Current specifications for meters are largely based on the requirement for billing and regulating the relationship between energy user and supplier. This gives a bias towards the utilities, specifications having been written around tariff requirements and not the needs of energy management.

BS8431 is a standard for electrical secondary metering that was proposed by the ESTA Metering & Monitoring Group (MMG) in 1994. British Standards commissioned the BSI committee PEL/13/-/5 to write a specification based on the MMG's proposal which will be available later this year. Ofgem-approved meters must be used in all situations where tenants are being charged for energy supply – these are suitable for use for energy management providing the data is made available to users.

However, the new BS8431 provides a more flexible way for users to specify secondary meters for energy management purposes – allowing them to more accurately balance the merits of performance and cost.

This means a simpler method of comparing different manufacturers' meters and preparing a subsequent specification, plus a reference document relating to meter functionality and accuracy. As for the meter user, they have the security of knowing that the installed meter will measure precisely and accurately the energy being consumed.

However, at ESTA we are well aware of the uncertainty that managers experience when first contemplating aM&T. The theory is sound but justifying the investment without any firm data relating to where energy may be being wasted, and how much, inevitably results in the thought: "but will it work for me?" Energy managers need to put their faith in aM&T. At the recent second National Conference on aM&T held at the Birmingham NEC this spring, a number of leading companies presented the hard facts of aM&T savings.

Presenting the facts

The conference attracted a record 225 delegates drawn from end-user sectors, M&E consultants, energy consultants, and industry experts.

MOD/London Army HQ

The MOD implemented a combined low-powered radio to read combined gas, water and electricity meters, some of which were mains powered and some solar powered. Use of the co-ordinated data allowed substantial savings from water leaks valued at £90,000 per annum. A review of the catering operation in order to reduce waste, plus the use of performance reports integrated into the existing management reporting system proved a key factor in identifying the potential savings and awoke the interest of line staff.

Superdrug

Superdrug found that the main advantage of implementing aM&T was regular refunds as a result of incorrect charging. The company developed a management system to evaluate investments and create a sound base for purchasing. The company is using the system to achieve a minimum energy cost consistent with customer needs and staff H&S entitlement.

The company has since invested in an energy manager and a centralised aM&T system. This has enabled store-based investment and improvements to be identified, the potential savings quantified and the implemented investments monitored for performance. Amongst items being employed are better lighting, an energy awareness campaign, more efficient heating and cooling, and investment in controls. Benefits amount to around £10 million over four years, based on an investment of £1.7 million.

management

Whitbread

With an energy bill of over £40 million, 4,500 meter points and a range of site sizes from very small to very large, the Whitbread estate presents a significant challenge for any structured energy management approach. Whilst a purchasing requirement is paramount, much attention is now being paid to the demand side, with objectives such as detecting over-consumption (including water) becoming more efficient.

An energy efficiency programme is being implemented using data on savings and performance provided by the aM&T system. Metering and data collection was installed virtually from scratch. The system has identified an overspend of over £1.2 million due to billing errors; it has also stimulated a saving of £1 million due to a new purchasing tariff, consumption/efficiency saving of around £3 million per annum, and around £0.4 million saved by reducing water leaks and wastage. In addition, individual site bills are known on the first of each month for each site and each brand, giving a substantial advantage to line managers in integrating energy into their everyday management activities.

Carbon Trust

Given the evidence of savings achieved on many sites and the level of potential energy/carbon savings attributed to implementing structured measurement and analysis systems, the Carbon Trust undertook a study to review this area covering all sizes of site. The results of the study were announced at the aM&T conference and will be published shortly as a Carbon Trust document. The main conclusions presented were that:

- Metering, monitoring and targeting is an important enabler for energy saving actions. The overall assessment is that an average of at least 5% energy savings can be achieved across the whole non-domestic sector. For the commercial sector, 15% energy saving can be achieved in around 20% of sites. While in industry, by fully utilising fiscal meters a saving of 5% is achievable, with another 3–5% available through the use of sub-meters.

- A range of M&T activities and technologies is suitable for all levels of user. A number of scenarios have been investigated including smaller sites where data from fiscal meters is the only realistic option, through to larger sites where extensive sub-metering could be justified. The conclusion was that by selecting the appropriate level, economic solutions are available for all sizes and consumption levels in non-domestic buildings.
- The principal barriers are not technical or economic, they are stakeholder-related and they operate over the whole value chain. They can be summarised as:
 - for energy users: low awareness of benefits, sceptical about payback, energy efficiency not a priority, lack of skills for analysis and interpretation;
 - for meter specialists: data availability from fiscal meters patchy and uneven, ownership and reasonability unclear; secondary metering sometimes too complex for non-expert users;
 - for government bodies: legislation traditionally not focussed on energy management/efficiency but focussed on infrastructure (supply side); and
 - for energy supply companies: focussed on price not service, no incentive to reduce customer demand.

It therefore seems that a whole range of organisations need to be involved in creating change to enable these systems to deliver their full potential. This includes users, regulators, policy makers, energy supply and energy efficiency industries, as the actions of a single stakeholder will not produce as much benefit as a co-ordinated team effort.

One of the final acts of this second aM&T conference was to propose to create a forum with all members buying into the principles that the Carbon Trust's independent study proposed. The conference acted as a key focus for this initiative and ESTA is prepared to continue this involvement by initiating action to create the forum.

If you are interested in participating in the forum and debate, please contact ESTA at tel: 07041 492049 or email: info@esta.org.uk. Conference presentations are available on the website at: www.esta.org.uk.

What is aM&T – automatic monitoring and targeting

We must measure to manage, and measuring requires metering – ideally both fiscal metering (for billing purposes) and sub-metering so that consumption can be broken down and assigned to departments, processes or tenants.

Automatic meter reading, by data collection systems such as building energy management or SCADA systems, allows large amounts of data to be gathered. Add this data to a sophisticated monitoring and targeting (M&T: set energy consumption and/or emissions targets and carefully monitor progress) system and you have an aM&T system capable of producing profiles, carrying out waste analysis and consumption alarm functions etc.

Automated data acquisition is the key – and computerised systems allow sophisticated analysis of large data sets, which manual systems or even spreadsheet methods cannot handle.

How to cut the cost of steam

Action Energy has recently revised two of its most popular publications aimed at companies wanting to save money on their steam and boiler operations. This month, *Energy World* reviews the new *Energy Consumption Guide ECG092 Steam distribution costs*. Next month we will take a look at *Good Practice Guide 369 Energy efficient operation of boilers*.

ECG067 was one of the most widely respected and helpful free publications and has now been updated under the Action Energy programme as *ECG092 Steam distribution costs*, to include the very latest cost information and technology developments.

Data from 100 sites have been pulled together in a benchmark guide aimed at engineers who want to reduce costs and run their steam systems at optimum efficiency.

The guide provides details of typical energy losses and factors affecting steam distribution efficiency, and recommends plenty of money-saving ideas. It explains how to calculate energy losses and steam costs, with up-to-date cost data, enabling readers to make comparisons with the 100 sites surveyed and to gauge their energy-saving potential. The guide also provides conversion factors for all types of fuels to a common base.

If your site could eliminate all avoidable energy losses associated with steam generation and its distribution, the minimum achievable cost would be 1.25p/kWh or £8.50/tonne. Against this, evidence from the 100 sites surveyed shows that the typical real figure is 1.6p/kWh or £10.90/tonne. Analysis of the steam use at the sites shows that average savings of 8% are possible, which would cut costs by 0.13p/kWh.

Reducing losses

Opportunities to reduce operating losses fall into five main categories.

Improve pipework insulation

Insulation often comes bottom of the list of



Adequate insulation on steam and condensate pipework reduces heat loss, resulting in improved efficiency of heat distribution

spending priorities for steam systems, and yet components such as valves, steam traps and separators can let significant quantities of useful heat escape, and are often easy to insulate for little cost. Of the 100 sites surveyed, 79 could have improved their steam distribution systems in this way. ECG092 shows how to calculate the wasted heat from uninsulated pipe work and fittings and how to work out the payback period.

Each uncovered pipe flange on the average steam distribution system is roughly equivalent to 0.6 m of bare pipe. A single uninsulated 150 mm flange could cost around £83/year in wasted energy.

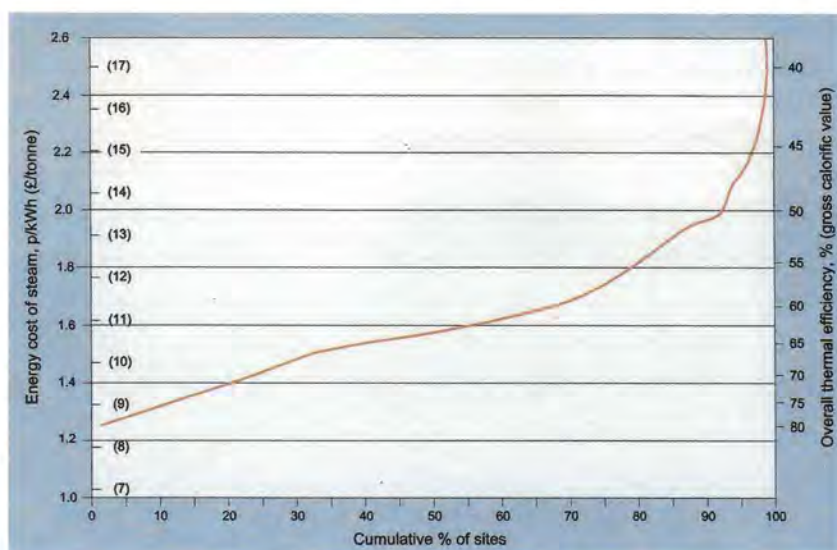
Return more condensate

Condensate contains around 20% of the original heat content put in to the boiler by the fuel. It is important to return as much of this useful heat to the boilerhouse for reuse. Of the sites surveyed, 34 could have improved condensate return. ECG092 will help steam system users identify the condensate lost directly to drain and in flash steam from condensate return systems. And don't forget that condensate system pipework should be well insulated to prevent valuable heat loss.

Isolate unused steam piping

Changes are often made to equipment at the end of the distribution system where the steam is used, but the pipes supplying the steam are not always isolated or removed. They continue to give up valuable heat at no gain to the user and should be removed at the first opportunity. In the survey,

Cost of steam at 100 sites surveyed in the publication



21 sites had unused pipe systems which could have been removed.

Improve steam trapping

Steam traps are necessary in any steam distribution system for condensate removal. Many traps are mechanical devices that require regular maintenance and, if not regularly inspected, can leak live steam to the condensate return system.

A single, continuously leaking 15 mm steam trap can waste £1,600/year. Eighteen sites where

found to have steam traps that could have been better maintained

Repair steam leaks

Even the smallest leak in a steam pipe can lead to heavy losses. The survey showed that 15 sites had leaking steam pipes. ECG092 shows how to calculate the cost of leaks on a steam system.

A single 1 mm diameter leak on a steam system of 7 barg will cost £210/year in wasted energy.

To obtain a copy of ECG092 Steam distribution costs: call the helpline on 0800 58 57 94; or download a copy from the Action Energy website at www.actionenergy.org.uk

Help from Action Energy

Action Energy provides free, impartial help and advice on implementing energy efficiency measures and on cutting energy costs to business and public sector organisations. The programme has already helped thousands of organisations, from major multinationals to small and medium-sized enterprises, reduce their energy consumption and carbon dioxide emissions.

The programme also offers financial support to help fund energy efficiency initiatives. For example, small and medium-sized companies in England, Wales and Northern Ireland can apply for interest-free loans of between £5,000 and £50,000 for investing in energy-saving projects. Companies operating in profit are also eligible for the Enhanced Capital Allowance (ECA) scheme when purchasing energy efficient equipment from the Energy Technology List. Over 6,500 certified products are listed. Investing in these products makes sound business sense – as well as providing tax relief, you'll benefit from lower lifecycle costs and by operating more efficient plant.

To find out more about how Action Energy can help your business, call the helpline on 0800 58 57 94 or visit the programme website at www.actionenergy.org.uk.

Promoting energy efficiency

The extensive Action Energy library contains many other publications promoting energy efficiency in boilers and heat distribution systems, including:

GPG369 Energy efficient operation of boilers (revised)

Key issues that users and operators should consider to gain optimum efficiency from steam boiler plant

GPCS442 Energy and cost savings from steam trap replacement (new)

Case Study from the refinery at BP Grangemouth

GPCS443 Improved condensate recovery reduces boiler operating costs (new)

Case Study showing Nestlé UK adapted a condensate recovery process to reclaim hot product condensate for reuse

GPCS444 Steam boilerhouse efficiency improvements (new)

Case Study demonstrating how Glanbia Foods improved a gas-fired boiler by retrofitting an economiser and advanced control system

GIR063 Energy management pathfinder (revised)

An introduction to all energy management publications available from Action Energy, signposting readers from one level of energy management competence to the next. Ideal for those new to energy management or those who want to go further

All of these publications can be ordered through the helpline or via the website.

Mitsui Babcock to cut energy bills at Grangemouth



Grangemouth aerial

BP Grangemouth has selected energy services provider Mitsui Babcock for an 'investment-led-contract' partnership aimed to reduce utility costs at the BP plant by 5–10%. Mitsui Babcock will adopt the risk for the project, investing up to £6 million in BP's plant and only being reimbursed once savings are made.

Mitsui Babcock fought off international competition for the business, after initially alerting BP Grangemouth to an opportunity to exploit substantial efficiency savings.

"We approached BP Grangemouth after a similar project at BP Coryton proved so successful," explained Les Morris, Director of Technical Services at Mitsui Babcock. "If we are convinced there are potential efficiency gains we'll consider making the capital investment ourselves. Then both re-payment and our service fees are paid through subsequent savings, once they are

realised. We have the capabilities for providing everything from specialist knowledge at the initial inspections through to the capital expenditure, so it would seem obvious to create these partnerships."

Before awarding the contract, BP Grangemouth drew together a multi-disciplinary team to assess and identify potential savings at the plant. Stuart Graudus, 3rd Party Specialist, at BP Grangemouth said: "We reviewed which options were available for the future steam and power provision at Grangemouth and concluded that continued operation of the existing plant was the most cost effective. We then tested the market to find a developer who could provide technical support while also providing additional commercial options.

Contact Mitsui Babcock via
www.mitsuibabcock.com

Flexible power volumes for BAA

Gaz de France ESS has signed a major new three-year supply contract with BAA plc to supply 654 GWh of electricity per annum to BAA sites across Gatwick, Heathrow and Stanstead airports.

"BAA were looking for a long term supplier, but because of the current volatility in the market they did not want to fix their volume," said Special Markets Energy Supply Manager Donna Smedley. "When they asked for a flexible product, we were able to quote based on a proven and running scheme which is almost one year old.

"There is so much volatility in the UK energy market that it's becoming increasingly important to offer the customers the option to lock in on a number of occasions, rather than locking in all of their contracts at a time when prices could be at a peak," said Donna. "Our flexible product allows a customer to fix half their volume on the contract day and secure their exposure. It's a way of spreading the risk, and it also affords them the flexibility to buy green or CCL-exempt energy should they choose to which was an important factor for BAA."

New heating system for fusion centre

The home of research into nuclear fusion, UKAEA's Culham Science Centre in Oxfordshire, has signed an energy services contract with Cofathec Heatsave. The Centre, which covers 180 acres, is the UK centre for magnetic confinement fusion research and the home of the major European fusion experiment Joint European Torus (JET).

Cofathec Heatsave is to replace the site's existing central oil-fired boiler plant and district heating mains with a modern, decentralised heating system employing gas-fired boilers and new gas main capable of managing a total installed load of 17 MW. "The company is providing Culham Science Centre with an economic energy services contract incorporating

third-party financing, design, supply, installation, and will be responsible for its operation over the next ten years," explained Deborah Smith, Deputy Contracts Manager for UKAEA, Culham Division.

Work is to start immediately to meet the site's 'Heat On' date of 30 September. Cofathec Heatsave engineers will utilise existing localised plant rooms to create a network of distributed boiler houses together with the addition of a packaged unit, all of which will be remotely monitored and controlled.

Contact Cofathec Heatsave via
www.cofathec.co.uk

Why buildings succeed or fail on energy

The first part of the guide covers building design. One of the key stages is the energy efficient brief, which should be no more complex than is appropriate for the type and size of building. It should incorporate such things as: the client's intentions, requirements and investment criteria; energy usage targets; environmental targets (eg BREEAM credits); and life cycle costs.

The guide then examines choices for each main element of energy usage: renewables, fuels, CHP and metering; control strategies; HVAC systems and plant, lighting, electrical power supply and office equipment.

The second part of the guide concentrates on the operation and refurbishment of existing buildings. In particular it describes the reasons why buildings fail on energy efficiency, the energy consequences of the failure and the measures required to avoid such failures.

One of the most significant additions to the new edition of the guide is the comprehensive reference data on benchmarks by type of building and type of room/area within the building or complex. The information has been collated from many separate sources and this is probably the first time that such extensive data has been published together.

The overall building benchmarks table provides data for typical building types such as further/higher education, hospitals, hotels, retail buildings. The main categories are further broken down into specific building type (eg department store, bank, supermarket, etc.) or room type (eg lecture room, science laboratory, hall of residence, etc.).

Benchmarking is only of use if the benchmarks are tailored to the specific type of building construction and the way the building is used. Following on from that, it is a management task to use the benchmark information as a means of implementing energy efficiency measures.

Whilst the design of new buildings is important, the main challenge is to improve energy efficiency in the existing building stock.

So, another addition to the new edition of Guide F is the checklist of 'Why buildings fail on energy'. As well as the obvious physical categories such as heating and lighting, also included are the role of management and the building's occupants. For each sub-category, the table shows the energy consequences and gives a guide on recommended avoidance measures.

For example on the building's ventilation, the failure situation might be the central system

operating at low loads for much of the year causing system inefficiency and energy waste. Recommended avoidance measures would include the introduction of variable speed drives and a move to a mixed mode (natural and mechanical ventilation) approach where possible for some periods.

Ensuring a building is properly maintained is an important part of any building manager's job. However maintenance is also an energy issue: poorly maintained plant will not operate efficiently. Each building is unique and maintenance regimes should be tailored to the particular building. When the European Directive on Energy Performance of Buildings comes into effect, regular inspection of boilers and air conditioning systems will be a requirement.

A detailed section on energy audits and surveys points out the value of identifying energy performance and gives a comprehensive site survey checklist. Audits are an essential part of the effective control of energy costs and should be undertaken regularly, typically every three to five years. Buildings regularly change, both physically in terms of structural changes, such as new partition walls, and in the way different parts of the building are used.

Although primarily targeted at building services engineers, the guide will be extremely useful to many other building professionals including energy managers, property managers, developers, architects and surveyors.

The environmental prize for the application of the good design and management principles set out in this Guide is huge. It is estimated that around 22% of the present energy consumed in buildings can be saved by 2010. With the dangers of climate change now ever more apparent, energy efficiency that reduces carbon emissions has never been more vital. The guide sets out how to achieve the reductions in the design and operation of buildings.

The Chartered Institution of Building Services Engineers (CIBSE) has published a revised second edition of its Guide F: Energy efficiency in buildings. First published in 1998, the new edition provides an invaluable guide to all aspects of energy efficiency and building services. The new guide has been expanded and brought up to date in the light of current domestic legislation, specifically Part L of the Building Regulations, and now includes CIBSE guidance on energy audits and surveys.

CIBSE Guide F costs £112 (plus postage) or £56 (plus postage) for CIBSE members. To purchase a copy of Guide F visit the CIBSE online bookshop at www.cibse.org/publications or phone 020 8675 5211.



PV system combines electricity generation with welcome shade



Horizontal louvres with integral solar cells

Exterior of Itoman City Hall with 'amahaji', a huge space under the eaves created by the south-side PV louvres



Itoman City, on the main island of Okinawa in Japan's subtropical oceanic climate zone, has a new City Hall. This is equipped with a 196 kW photovoltaic (PV) system, one of the largest used to date on a local government building in Japan. The system has been installed on the south side and the roof of the building, reducing the

use of conventional energy. The building's novel exterior promotes Itoman as a 'clean energy town'.

In 1996, Itoman City formulated the 'Itoman City New Energy Vision': its objective was to raise citizens' environmental awareness and to contribute to a pleasant global environment by introducing new forms of energy into all newly planned public buildings. As part of this initiative, the city installed the PV system in its new City Hall, a reinforced concrete building with five stories above ground and a total floor space of 15,000 m². The building was completed in the first part of 2002.

About 2500 PV modules cover the roof and the south side of the building: these act as sunshade louvres to diffuse the strong sunlight of Okinawa and provide a pleasant internal atmosphere. The louvres contribute to energy savings in two ways:

- they generate 12% of the electricity

consumed by the City Hall; and

- their sunshade effect limits the degree of solar heating, reducing consumption of energy for air conditioning by 25%.

Moreover, the layout of the louvres on the south side – avoiding any overlapping – creates a huge space under the eaves. This 'amahaji' is a traditional style in Okinawan architecture, protecting the building from sunlight, wind and rain. The amahaji has become a symbol of this new, community-focused City Hall.

Because the new building is located near the seashore, there is the possibility of salt accumulating on the lower sides of the panels. To avoid this, there are no upper and lower supports on the right- and left-hand sides of each panel: this differs from the more common four-side support structure and allows any accumulating salt to be washed away by rainwater. As the Okinawa region is often hit by typhoons, double-tempered glass has been applied to the front and back of each panel to maintain its strength. The 12 mm-thick glass on the back, in particular, can provide protection against high winds during typhoons.

The PV system generated 220 MWh in the year from May 2002 to April 2003, a little more than expected: it also reduced carbon dioxide emissions by about 190 tonnes (based on a carbon dioxide emission coefficient for Okinawa's energy consumers of 0.86 kg CO₂/kWh). The numerical savings and reductions are displayed in real time in a public gallery display panel on the first floor of the City Hall. This, as well as the building's striking exterior, highlights for visitors the potential of PV power generation and energy conservation.

The new City Hall has also adopted an ice-based thermal storage air-conditioning system, a rainwater-recycling system, and two lightwell-type open spaces for natural ventilation and lighting. The result is an environmentally sound building suited to the climate and natural conditions of Okinawa.

CADDET – clean energy information for a global market

This article is reprinted with permission from issue 4/03 of *Infopoint*, published quarterly by CADDET, the international Centre for the Analysis and Dissemination of Demonstrated Energy Technologies.

CADDET was established in 1988 under the auspices of the International Energy Agency (IEA), in response to concerns about the security of energy supplies and the threat of global warming.

The participating countries wanted to pool their knowledge and experience of applying energy efficient technologies to reduce energy consumption in buildings and industry. A second programme was launched in 1993 to address the growing interest in renewable sources of energy.

Visit the CADDET website at: www.caddet.co.uk

Renewable energy from the ground

GeoScience Limited – the UK's longest established designer and installer of ground source heating and cooling systems have installed sizeable new heating systems at a YHA development at Lee Valley Country Park not far from London, and the Pencoy's School in Cornwall. The two new systems are part of an increased workload, says the company, that has seen orders worth 20% of last year's turnover secured already this year.

The YHA development of five lodges and a main reception block sits in the 10,000 acre Lee Valley Country Park at Cheshunt. The design concept behind the scheme was that the development should be sympathetic to the surrounding landscape and also be environmentally friendly.

Given that there is a sizeable lake in close proximity to the lodges, a closed loop EarthEnergy system designed to extract renewable heat energy from the lake was the natural choice for the heating systems.

Each Lodge requires 20 kW of space heating and the main reception block requires around 60 kW with the overall scheme requiring around 160 kW of space heating.

The pond loop heat exchanger is fabricated from coils of high density polyethylene pipe, which have been sunk to the bottom of the adjacent lake. The loops are manifolded together onto flow and return headers, which go back to a small plant room in each building. Each building water circuit supplies a Viessmann water-to-water, closed loop ground source heat pump. The main reception block utilises three of these heat pumps to meet the required heating load.

When compared with traditional heating equipment, the EarthEnergy system reduces annual carbon dioxide emissions by around 47 tonnes compared to natural gas and around 105 tonnes compared to oil, estimates the company.

Meanwhile, Pencoy's school at Four lanes in Cornwall is the first PFI funded school in the UK to benefit from a GeoScience EarthEnergy ground source heating system. The EarthEnergy system was designed by GeoScience Limited to provide for all the heating requirement to the wet underfloor heating system within the building.

With an overall floor area of 1100 m² to be heated, the underfloor distribution requires around 60 kW of heating.



The EarthEnergy system comprises ground loops installed in two arrays of eight boreholes drilled through granite and clay to meet the heating load. Viessmann water-to-water ground source heat pumps supply all of the heating to the underfloor heating.

EarthEnergy says it has been designing and installing closed loop, earth source heating systems for ten years and has installed systems in five schools and over 100 individual properties for housing associations.

The five YHA lodges at Lee Valley Country Park – all heated by water-to-water heat pumps (Courtesy Viessman UK)



Cornwall's Pencoy's School is also heated by a ground source heat pump (Courtesy GeoScience Ltd)

Olympic gold medallist to present El Awards

The three times Olympic gold medallist Matthew Pinsent is to speak at this year's Energy Institute Awards ceremony and present the winners with their trophies at the Gala Dinner on 22 November.

Now in their fifth year, the El Awards, originally part of the Institute of Petroleum's activities, acknowledge outstanding new initiatives, examples of good practice and are recognition of excellence and innovation in the energy industry. They also offer companies of all sizes the opportunity to showcase their groundbreaking accomplishments in the international arena.

Since the creation of the El last year, the Awards – with the support of participating organisations – have been broadened in scope to encompass entries from all areas of the energy industry. The eight Award categories are:

- Communication (sponsored by ABN Amro);
- Community Initiative (sponsored by BG Group);
- Environment (sponsored by KPMG);
- Innovation (sponsored by ExxonMobil);
- International Platinum (sponsored by Total);
- Outstanding Individual Achievement (sponsored by Norman Broadbent);
- Safety (sponsored by Shell); and
- Technology (sponsored by Eni Group).

Louise Kingham, El Chief Executive, says, "Last year, over one hundred companies – ranging from small consultancies to major oil companies from around the world – participated in the competition. Judging for each category was based on

achievements deemed to have had the most impact or potential impact on the industry. I would like to encourage companies and individuals to enter this year's Awards competition and participate in the celebration of the industry's achievements."

Last years winners included Schoolscience Ltd for 'Discover Petroleum'; BP Exploration Angola for its humanitarian aid for Angola; Walsh environmental scientists and engineers for their canopy bridges along a rainforest pipeline in Ecuador; Shell International Exploration and Production for its expandable tubular and monoDiameter technology, and for its Brent Alpha redevelopment project; Comgás – the Companhia de Gás de São Paulo for safety performance; the Indian Oil Corporation Ltd for technology to dispose of oily sludge; and Vicky Robinson of BP Tanzania Ltd for her 'Beyond Petroleum and Blessed Pupils' project.

The judges, who will be looking for a 500–1000 word synopsis of competing projects, in the first instance, will meet in the autumn to choose a winner in each category.

The deadline for submissions is 2 July. Members and non-members of the Energy Institute are welcome to enter. For further details and an entry form, please visit www.eiawards.com, or contact Lynda Thwaite, Events Organiser, tel: +44 (0) 20 7467 7106 or email: lthwaite@energyinst.org.uk

2003 Award winners assembled – the deadline for submitting entries for 2004 is 2 July



ei awards 2004

Wind power and electricity load fluctuations

Dr Swift-Hook's reference to intermittency: "the availability of generation is irrelevant as long as the electrical load varies so widely and so randomly huge statistical fluctuations of the load" shows a high degree of ignorance of how National Grid controls frequency/voltage and therefore the impact that large intermittent generators will have on grid centre operations. Indeed, the NETA system to which Dr Swift-Hook refers could not operate if there were frequent large random fluctuations in demand.

For the UK network, Annual Load Duration Curve diagrams are published annually by each of the three supergrid transmission companies on the mainland of Great Britain, in their statutory Seven Year Statements. These curves are invaluable base data, having been archived for decades. Far from showing meaningless, random, or seasonal variations as suggested by Dr Swift-Hook, they are incredibly accurate records of the consensus of aggregate needs of domestic, commercial and industrial consumers. They can and are built upon, together with other predictable electricity demand-affecting events, to plan the balancing of the entire UK supergrid system efficiently within NETA.

Inspection of the annual load duration curve reveals that, currently in the UK, base MW never falls below about 38% of the peak. The shape of the curve clearly indicates the strategic need of the whole

system to be in two parts – generators able to run continuously at or near full load on a near annual basis, but able to be run up or run down to full load if and when required. This is equivalent to around 40% of the total MW maximum demand level and 60% of the kWh units generated by the whole system per annum. Although continuous running is the main requirement, all generators must be fully controllable as to output at all times.

The remaining 60% of the total MW demand of the system must be covered by load-following types of generation which are continually controllable as to output. Some, such as hydro and gas turbines are particularly valued for the speed of their load response.

The statistical variation in total wind power that Dr Swift-Hook correctly identifies, will represent a massive and novel challenge to grid control capacity. The variation could exceed the correcting capacity of control plants even in a large grid system and will happen far more frequently in periods of unsettled weather than ever occurs with large thermal plants. The inevitable geographical distribution of large wind farms will also exacerbate the problems, as power is likely to feed into a small number of distinct high voltage lines and could overwhelm the capacity of local switchgear and protection systems.

Paul Spare MEI

So wind power is intermittent and unreliable, Dr Swift-Hook seems to say, but this doesn't matter because electricity demand itself varies randomly. Unless he means that the contribution of wind power is so negligibly small that it is lost in the noise level, this is nonsense. Most of electricity demand is highly predictable. Even with the awful NETA system, buyers predict their requirements when

placing their hour to hour contracts. And generators plan their main outages (for routine maintenance) to coincide with seasonal troughs in demand. Unplanned outages – especially for the nuclear stations – are almost negligible. By contrast, unplanned outages of windmills are the rule. But this is only to say that they make no contribution to meeting the main requirement of any robust

electricity system – that it should be able to meet the demand in kW at any time of the day, night or year. By its nature, wind power is quite incapable of being used to meet demand in kW, as distinct from making a minuscule, unreliable contribution to the system in terms of kWh of energy.

Dr LG Brookes FEI

Dr Swift-Hook responds

The variations in electrical demand due to peaks and troughs in the load have to be covered by stand-by plant whether they are predictable or not. On top of the peak, the substantial 'planning margin' of 20% or more additional spare capacity reflects the uncertainties of all the power plants on the system, including nuclear. Incredibly accurate records of past outages do not make future outages highly predictable.

On the other hand, despite its variability,

the contribution that wind plant makes to firm capacity in kW is equal to the average power output. As far as predictability is concerned, wind availability can be anticipated quite accurately (particularly so over several wind farms) from meteorological data if necessary. An hourly time scale is all that is needed to call up (or shut down) gas turbine or other alternative plant. It is against this background that wind variability has to be seen.

For wind power, on the other hand, most subsidies in the UK are quite modest now. Furthermore, it is demonstrable that penetrations of 25% or more can be readily accommodated by modern power systems in Denmark and north west Germany with no additional plant and no massive novel challenge to grid control capacity, so future prospects are bright.

DT Swift-Hook FEI

Ex-CEGB man Donald Swift-Hook's viewpoint article (Energy World April 2004) attracted some comment. Edited extracts from two letters, and an edited response from the original author, are given below. Some of the debate over the relative true costs of nuclear and wind energy have been edited out – the issue is unlikely to be settled in this forum.

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Energy Institute, 61 New Cavendish Street, London W1G 7AR

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7	West Pennines	282	266	170
8	North West England	307	286	191
9	Borders	283	281	203
10	North East England	287	291	188
11	East Pennines	285	272	175
12	East Anglia	297	281	183
13	West Scotland	312	290	204
14	East Scotland	309	288	199
15	North East Scotland	321	305	215
16	Wales	281	276	210
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COURSE VENUE:
London, UK

EI MEMBER:
£1400.00
(£1645.00 inc VAT)

NON-MEMBER:
£1600.00
(£1880.00 inc VAT)

INTRODUCTION TO PETROLEUM ECONOMICS

This **three-day course** concentrates on the economic issues facing the oil and gas industry, their geopolitics and the workings of their principal markets. It provides an introduction to the economic and commercial background and general trends of the upstream and downstream sectors of the petroleum industry, underpinning an understanding of oil and gas products and their markets with an awareness of global and strategic economic issues. Participants will gain an appreciation of the issues through a series of regional case studies spread throughout the course.

WHO SHOULD ATTEND?

Professionals from a wide range of technical and commercial backgrounds; those employed by financial, commercial, legal, insurance, governmental, service, supply and advisory organisations; analysts, economists, new starters, engineers and risk managers.



COURSE DATES:
14 - 17 September, 2004

COURSE VENUE:
London, UK

EI MEMBER:
£1900.00
(£2232.50 inc VAT)

NON-MEMBER:
£2100.00
(£2467.50 inc VAT)

SUPPLY AND DISTRIBUTION: ORGANISATION, OPERATIONS AND ECONOMICS

This **four-day course** will examine the impact on supply and distribution of: refineries' output and fuels' specifications; product sourcing - parent-company refinery, open-market, ex-rack, exchanges; primary-supply mechanisms used; terminal design and location.

The overall effect of the network, network planning, and that of competitor locations on routing, load optimisation and backhauling operations will be discussed, as well as the benefits of multi-shift delivery patterns.

Staffing levels and training, safety and environmental issues, transport operations (in-house and contract haulage), together with benchmarking techniques allowing the assessment of performance against competitors to identify opportunities for improvement will also be scrutinised.



For more information, see enclosed inserts or contact Nick Wilkinson

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or visit: www.energyinst.org.uk e: nwilkinson@energyinst.org.uk