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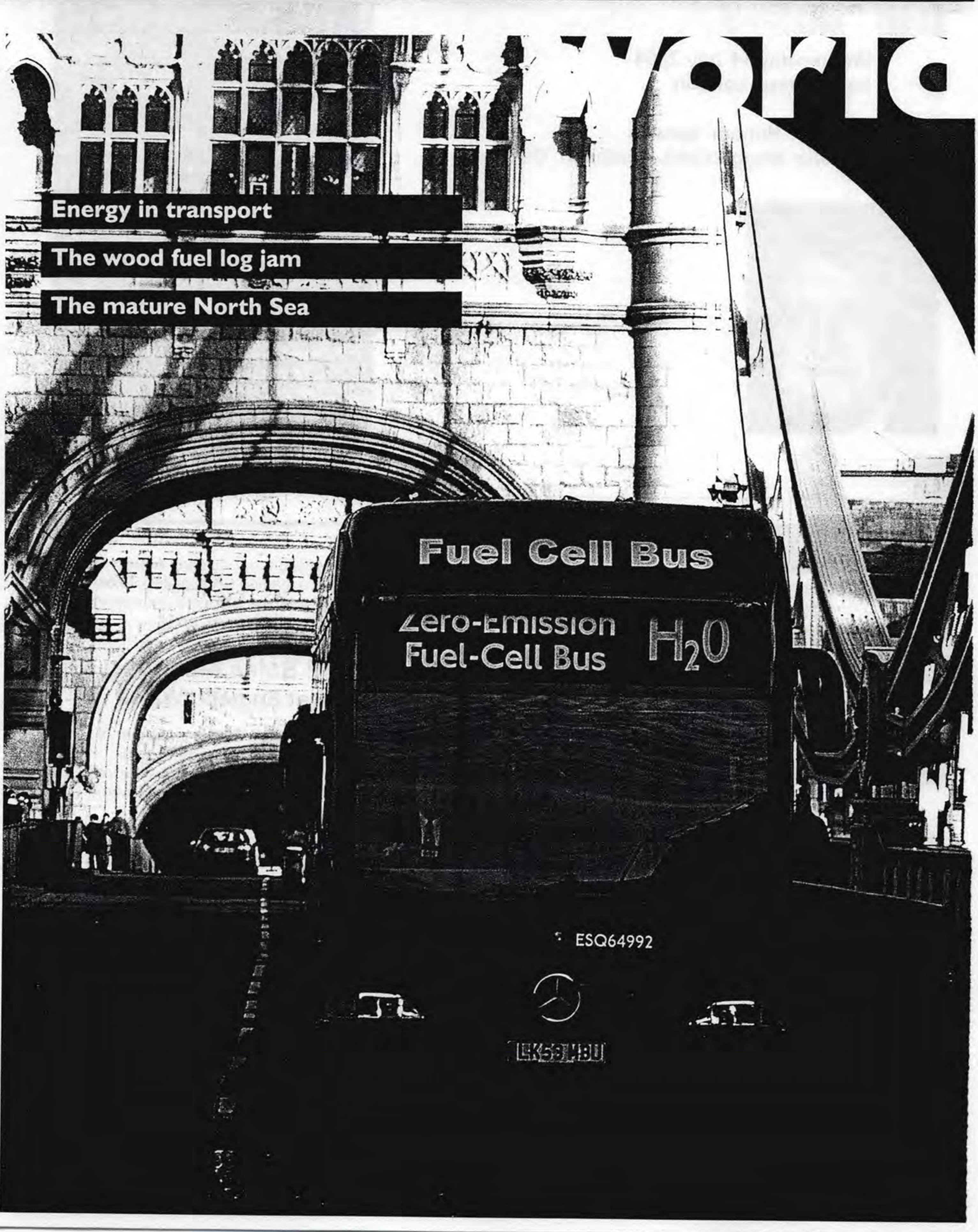
Energy in transport

The wood fuel log jam

The mature North Sea



April 2004

Cover

London's first three hydrogen fuel cell buses have been operating on the 25 route (Ilford to Oxford Circus) since mid January as part of a two-year, 10 city European project to reduce air pollution and noise. See page 10 onwards for this month's feature on energy use in transport and transport fuels.

This issue of *Energy World* also covers UK developments in wood fuel use and the impact of severe weather events on the electricity industry (and vice versa).

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Wind is a winner – and clean coal could push nuclear into third place

fter the oil peak", the situation "is likely to demand the reinstatement of nuclear power" and renewable energy may only be able "to help a bit", according to *Energy World* (February 04, page 22). And Finland leads the way in Europe with plans for a 1,680 MW nuclear power station at Olkiluoto", enthuses an *Energy World* Viewpoint (March 04), relegating renewables to second place.

I think these analyses of the situation are wrong, not for any technical reason but for political and financial reasons. You don't have to believe everything Prime Minster Blair says but you should listen carefully when he takes the trouble to open the first British off-shore wind farm at North Hoyle in person. "We are on our way to a future that can be transformed by the use of clean forms of energy", he said – and he was not talking about nuclear.

Wind ahead of nuclear

The total amount of wind capacity commissioned in Europe over the last three years far exceeds the amount of nuclear plant commissioned in the whole of the last decade. Germany built 3,000 MW of wind farms last year alone. In February 2004, the Minister responsible for UK renewable energy announced approvals for more than 5,000 MW of wind farms by 2010 (and a lot more than that by 2015). So the European picture is clear: wind is running a long way ahead of nuclear at present.

It is true that most of this development has been based upon subsidies – but that is true of most nuclear development too.

The big difference now is that modest subsidies for wind energy and other renewables will continue, with strong political and popular backing, while the opposite is true for nuclear power with its large nuclear legacy. When the UK's new NETA arrangements put a stop to the substantial NFFO subsidy and brought electricity prices down, the nuclear generating company, British Energy, went broke and needed Government support. The cost penalties of decommissioning will more than double what the UK has to pay as it continues generating nuclear power over the next 20 years. Rightly or wrongly, public perception of nuclear technology is very negative. (I think wrongly, by the way, but that doesn't help nuclear very much.)

Finland is a small country which seems to have economics and attitudes that are different from most of the rest of Europe. For example, objections to nuclear waste were overcome there 20 years ago. This is in sharp contrast to almost every other EU country, with the possible exception of France. Perhaps the climate is to blame.

Many of the renewables are intermittent, but the availability of generation is irrelevant as long as the electrical load varies so widely and so randomly. Only when the statistical variations of the total wind installation around the country become appreciable compared to the huge statistical fluctuations of the load will any difference even be noticed. Then we can expect the difference to be handled in the same way as the huge existing fluctuations in load are, with spare plant capacity. Only when wind power reaches the capacity of today's nuclear plant will that situation arise, and that is 20 years away.

Enormous reserves of coal

But the nuclear enthusiasts miss another option which is staring us all in the face – coal. Gerald Clarke says (*Energy World* Viewpoint, March 2004), "Coal is a fuel which everyone agrees has had its day" but the world is not listening to him. It still relies on coal for more of its power than any other fuel. Flue gas decarbonisation (taking out the CO_2) could make coal as clean as nuclear or the renewables, at a price.

In March 1993, I wrote a Viewpoint for *Energy World*. It was a fairy story but I made the deadly serious point that a rapid run-down of the coal industry was inevitable in Britain's circumstances. It was simply not possible to avoid it. This seemed unbelievable at the time, which was why I presented it as a fairy story, but of course it happened.

But the reverse could happen just as quickly. There are enormous reserves of coal, is enough for a thousand years at present rates of consumption. All of it is at a price, but we can easily go back to coal when the price is right.

Oil-from-coal is not a pipe-dream. It is standard, commercial technology today. When the reservoirs of oil run out, there will still be plenty of coal down there. Gas-from-coal had its day thirty years ago and we all use the natural stuff nowadays but coal-gas too could come back, when the gas peak is past and the price is right.

I favour wind, myself. You don't have to clean it up when you want to use it. I'm not against nuclear, in those countries where it is cheaper, but make no mistake: nuclear is not the only other long term option. When the peaks are past and the price is right, clean coal could come back alongside the renewables.

Dr Donald Swift-Hook, FEI is a private consultant and Secretary to the World Renewable Energy Council.

IEA commends Finland's market-based approach to policy

Finnish energy policy has an excellent record of using market forces and international trade to achieve economic efficiency and enhance national energy security, according to: *Energy Policies of IEA Countries – Finland 2003 Review* published by the International Energy Agency (IEA). Finland is to be commended for its liberalised electricity market which, as a part of Nordpool, has been a model of competition for many countries, adds the Agency.

Local energy company TVO's plans for a new nuclear power plant (see *Energy World* February and March 2004) have drawn considerable attention, since it would be the first nuclear facility to be built in a liberalised marketplace.

The Finnish Government has adopted an appropriate attitude towards the proposed plant, says the IEA. In accordance with its market-oriented approach towards the country's liberalised electricity sector, the Government has allowed the project to develop as a private, independent initiative responding to the needs of the marketplace. It has given neither an explicit endorsement of the plant nor state guarantees of any sort. The vigorous and open national debate about nuclear power and the efforts to provide for safe long-term waste disposal are both commendable aspects of a successful nuclear programme.

Development is proceeding apace, yet the complexity of the project and its novelty as the first nuclear plant in a liberalised electricity market may give rise to obstacles or delays. Since the country will rely on the new plant for needed electricity capacity, and as a means of reducing greenhouse gas emissions, the Review recommends that the Finnish Government should monitor its progress and stand ready with alternative plans if delay or other obstacles arise.

Meanwhile, energy security is an important issue in Finland, which has essentially no fossil fuel resources and its location makes energy connections with other EU countries difficult. On the demand side, Finland's energy-intensive industry and cold climate make the provision of reliable, reasonably priced energy absolutely necessary. Faced with such challenges, the country has developed an admirable degree of security, achieved largely through international energy trade, fuel-switching capabilities and an impressive diversification of fuels. The stocks of imported fuels corresponding to five months' average consumption, far beyond the IEA's obligation in terms of volume and coverage, shows its strong determination on energy security.

However, expanded international energy connections could further improve Finland's energy security. A more co-ordinated approach among Nordic countries towards financing transmission investments would improve system efficiency and minimize risks associated with extensive international electricity trade, says the Review.

On the environment, Finland has agreed to keep its greenhouse emissions at 1990 levels during the Kyoto target period of 2008–2012, although projections now show emissions rising 15% above 1990 levels by 2010. The National Climate Strategy is an important tool in meeting Finland's targets, although the IEA says that the country will face two major challenges in this area. The main one is integrating international emission reduction tools into the domestic policy framework – the Government must determine how domestic measures such as taxation and voluntary agreements should be altered, if at all, when the EU emissions trading programme comes into force.

A major shift in the choice of fuels for the power generators of the world will result in investment of over one trillion dollars in coal-fired generation plants between 2004 and 2020, according to a new report: *World Power Generation Projects* by the US-based McIlvaine Company.

The total includes both the investment in new plants and the upgrading of existing plants.

McIlvaine says it has identified three hundred projects for new coal-fired plants. The largest of these plants is 3,600 MW and will require an investment of \$4.3 billion. Even the smallest projects will require investments of more than \$300 million each. The largest number of planned plants is in China, followed by India and the US.

In the US there has been a complete about face on fuels in the last four years, says the report. In 2000, it was assumed that nearly all the needed capacity increases (14,000 MW per year) would be through gas turbines. It is now clear that natural gas will not play an important role as a fuel for base loaded power generation. The cost of gas has risen to or above the price of the electricity which would be sold by the plant. A number of recently-built gas-fired plants are not operating for this reason and there is no expectation of reduction in gas prices. As a result, there have been dozens of announcements of new coal-fired projects just within the last few months, says McIlvaine.

New solar power systems for California, Germany

Two large new solar power systems are being installed in California by the PowerLight Corporation: a 200 kW system at the US headquarters for SANYO North America, located in San Diego, and a 457 kW system at Saint Francis Winery in Santa Rosa.

The SANYO installation, unsurprisingly to be built of high-efficiency SANYO solar photovoltaic modules, will consist of a 150 kW roof-mounted system on the headquarters building and 50 kW sun-tracking system on the company's adjacent carport structure. The St. Francis Winery installation, which will provide more than 30% of the winery's energy needs, will be completed in May.

PowerLight is also providing energy-efficient lighting at the winery, which will reduce the winery's electricity demand for lighting by 48%.

Meanwhile, Shell Solar GmbH and the Gesellschaft fur Solarenergie (GEOSOL) have announced that they will build a giant, 5 MW, solar photovoltaic power system south of Leipzig, Germany. The system will rival similar large systems planned for southern California and Arizona.

New hydropower plants for Sudan and China

The first of VA Tech Hydro's 'Hydromatrix' hydropower plants has begun commercial operation at the Jebel Aulia dam in the Sudan. The Hydromatrix concept combines the benefits of conventional technology with the advantage of low-cost installation in existing dams and weir structures, says VA Tech.

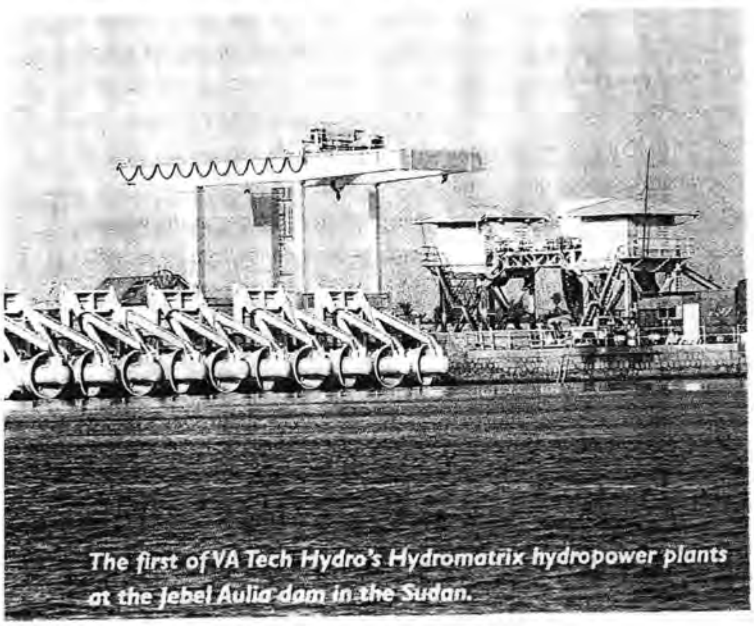
The technology allows dam owners to fall back upon unused hydropower potential at many of their rivers and thereby make use of precious renewable energy sources.

The entire scheme will comprises 80 units, including the required mechanical and electrical auxiliary systems as well as a new dam crane. The output of the new power plant will be 30.4 MW. VA Tech successfully completed the installation and commissioning of the first ten turbine generator units in early January and they have been supplying electricity into the grid of the National Electricity Corporation, Sudan's power supply company, ever since.

The 80 turbine generator sets of the Jebel Aulia power plant will be installed in 40 modules by pairs. Forty of the 50 dam openings will be equipped with hydromatrix modules. Installation work on the next units is already in full swing, with 10 turbine generator units being commissioned every two months. Full operation of the power plant is scheduled for early 2005.

Built between 1933 and 1937, the Jebel Aulia dam at the White Nile is located about 40 km south of the capital Khartoum and serves to irrigate adjacent farmland.

Meanwhile, VA Tech Hydro has won contracts on two hydropower plants being built in China. The company is to manufacture and supply runner blades for the Xia Long Men power plant project, and to supply Kaplan bulb turbine components for the Zilanba project in the province of Sichuan. France's Alstom is also active in the same area, having signed a contract to supply equipment to the Zhanghewan pumped storage hydropower station in the north-east province of Hebei. VA Tech Hydro says it has supplied equipment to more than 20 hydropower plants in China since 1978.


The first of VA Tech Hydro's Hydromatrix hydropower plants at the Jebel Aulia dam in the Sudan.

Study on carbon dioxide capture and recovery

The Fluor Corporation has been selected by the International Energy Agency Greenhouse Gas Research and Development Programme to conduct a study on the capture and recovery of carbon dioxide in the power industry.

Fluor will be working with Mitsui Babcock, Alstom Power and Imperial College to determine the cost options for capture and recovery of carbon dioxide from natural gas combined-cycle and pulverised-coal fuelled power generation plants. The study will investigate unresolved issues on capture technology integration into a power plant. The team will also visualise likely technology developments over the next two decades and will produce road maps for the introduction of this technology.

Fluor's office in Camberley, UK, will lead the work, with input from the company's global technology and industry teams located around the world.

"The capture and storage of carbon dioxide is an important option for tackling greenhouse gas emissions and Fluor's work, in carbon dioxide capture from combustion/power plant flue gas, complements our strength in designing and building power plants globally," said Jeff Faulk, Fluor's Group President of Oil, Gas & Power.

Fluor has developed proprietary technologies used for amine scrubbing of fuel gases. In recent years, the company has completed studies for clients such as the CO_2 Capture Programme, BP, Statoil and the Canadian Clean Power Coalition, focusing on carbon dioxide capture from both new and existing power plants.

The IEA Greenhouse Gas R&D Programme is an international collaboration of member organisations which evaluates technologies for reducing emissions of greenhouse gases and disseminates the results.

Restoring Iraq's power system

The US Army Corps of Engineers has awarded three separate task orders, together worth $154 million, for electrical power restoration work in Iraq to the Fluor Corporation. The task orders are the first to be placed with the company under a contract awarded in January for potential work within the US Central Command area of operations, including Iraq.

The orders call for Fluor to rehabilitate multiple power generation facilities in Baghdad, reconstruct a power transmission line in northern Iraq and restore a water intake facility at a thermal power station in southern Iraq.

Under a previous Corps of Engineers contract, issued in April 2003, Fluor is continuing to help repair central Iraq's electrical infrastructure.

Since April 2003, the company has been awarded more than $600 million in Iraqi reconstruction work under various US Department of Defense contracts. The projects have included operations and maintenance services, building renovation, force protection and electrical infrastructure repair.

US power companies commit to greener operations

Five US power companies have committed to work with the World Wildlife Fund (WWF) to use clean energy sources and to cap their carbon dioxide emissions. The five companies are Austin Energy of Texas; Burlington Electric Department of Vermont; the Sacramento Municipal Utility District (SMUD) of California; Waverly Light and Power of Iowa; and FPL Group Inc, which operates Florida Power and Light.

The companies joined the 'WWF PowerSwitch! Challenge', which calls for power companies to support binding limits on national carbon dioxide emissions and requires them to undertake one or more of the following action targets:

- using renewable energy as the source for 20% of their electricity sold by 2020;
- increasing their energy efficiency by 15% by 2020; or
- retiring the least-efficient half of coal generation by 2020.

SMUD committed to the renewable energy goal, FPL Group and Waverly Light and Power committed to the energy efficiency goal, and Austin Energy and Burlington Electric committed to both of those goals.

Spain, Britain the most attractive for investment in renewables

The third Ernst & Young 'Renewable Energy Country Attractiveness Index' has returned Britain to the top spot as the most attractive national investment environment for wind power, and second position in terms of overall renewable energy. Spain holds on to first place in the Index by outperforming the UK in terms of potential for solar and biomass investment.

The tables chart attractiveness for future investment, so countries like Denmark with an already well-developed wind sector, do not necessarily score so well.

Ernst & Young's Jonathan Johns believes that the UK provides a friendly environment for renewable energy as a whole and in particular the wind sector with a combination of an attractive capital allowance regime and the availability of capital grants. The only disappointing score in the index for the UK remains in the solar sector, which continues to be too expensive for investors.

Spain once again tops the main table. Johns explains, "Spain's lead in the international renewables index continues to be due to the deregulated domestic market and an attractive planning environment as well as good access to finance. Spain has an attractive onshore wind market due to the high installed capacity, strong national players, ambitious national RE targets that filter down to regional level. Spain also benefits from a very high solar resource with growth being driven by a Government with ambitious targets for renewable energy and the relatively attractive feed-in tariffs."

Germany has improved its position since 2002 to third place across all sectors, due to the renewal of its tariff, and is second only to the US in terms of solar power, with some high profile projects like Berlin Hauptbahnhof train station. Financing, however, remains difficult in this market and capacity increases are likely to fall. The 20 year Government guaranteed feed-in tariff is also encouraging development in the wind and biomass sectors, although there are some concerns about the ongoing availability of bank financing.

Although it has slipped a position in both the overall renewable and the wind rankings to fourth place, the USA remains an attractive venue due to the largely deregulated electricity market, the wide availability of land and a favourable planning environment. However the delays in the passing of the Energy Bill last year, and the subsequent lack of tax incentives for wind and biomass projects is responsible for the decline, says Ernst & Young.

FGD for power plants in China and the US

Contracts to fit flue gas desulpurisation (FGD) equipment to coal-fired power stations in both China and the US were signed in February.

The Power Generation Group of US-based Marsulex was awarded a contract to supply technology, engineering and equipment for Beijing Datang Electric Power Company at the Gaojing Power Plant in the People's Republic of China. The company's limestone-gypsum FGD system will be installed to reduce sulphur dioxide emissions by 95% from Gaojing Units 5–8, a total of 300 MWe. The contract, which represents the fourth successful project in China for Marsulex, has been awarded through Ever Cleaning Environmental, Inc, a US firm specialising in commercialising technologies in China.

And the Chinese market for FGD is strong, according to Marsulex President and Chief Executive Officer, David Gee, "The construction of new power plants in China, and the retro-fitting of existing coal-fired plants with FGD technology to improve air quality in advance of the 2008 Olympics, has made China the world's leading growth market for FGD systems."

Marsulex has recently completed the supply of similar technology and services to the Shajiao Power Plant in Guangdong Province.

Meanwhile Alstom, in consortium with Stone & Webster Inc, has entered into an alliance agreement with Duke Power to progressively retrofit four US power stations with (FGD) systems to control sulphur dioxide emissions.

Under the terms of the agreement, Duke Power has awarded the consortium a contract to retrofit the first of these four power stations; Marshall Steam Station in North Carolina. Alstom will design, engineer and procure the process island (scrubber) – the technology used to remove sulphur dioxide from power plant emissions – and Stone & Webster will perform balance-of-plant design, engineering and procurement, as well as construction services for the scrubber installations.

The alliance agreement envisages retrofit by the consortium of a total of twelve units (6,600 MW) at four power stations that are owned by Duke Power. The other stations are the Belews Creek, Allen and Cliffside stations in North Carolina.

London Energy Strategy: cut carbon, improve security, eliminate fuel poverty

London's Mayor Ken Livingstone has launched the 'Energy Strategy for London' and announced up to £15 million of funding to help Londoners reduce their energy consumption. The city is a major consumer of energy, currently using more than the whole of Ireland, or about the same amount as Portugal.

High on aspirations, the Strategy aims to eliminate fuel poverty, reduce carbon emissions and improve security of energy supplies in the capital.

One of its aims is to set up the London Energy Partnership to ensure that the city gets its fair share of investment and expertise. One example is the £15 million 'Powergen HeatStreets London' scheme, organised in conjunction with a Powergen, which will improve energy efficiency in homes. Areas of London will be identified and homeowners will be offered advice on a street-by-street basis on how to save energy in their homes and at the same time reduce bills and make their homes warmer.

Homeowners will then be offered discounted energy efficiency measures, which will be free for vulnerable householders. The funding of up to £15 million pledged by Powergen will have to be matched with funding from housing associations, local authorities and LDA regeneration budgets, which would bring the total to £30 million.

The HeatStreets London scheme will be piloted in Lewisham from the beginning of this month.

Other measures in the Strategy include:

- Seeking the commitment of boroughs, Transport for London, and other key organisations to deliver the strategy's targets by inviting them to sign a declaration of their support and commitment.
- The expansion of the Mayor's Green Procurement Code to cover energy use and carbon dioxide emissions, for London's businesses to sign up to.
- Targets for a 20% reduction of carbon dioxide emissions by 2010 (based on 1990 levels) and a 60% cut by 2050 (relative to 2000 levels). The Mayor believes there should be at least one zero-carbon development in every London borough by 2010.
- The commissioning of the London Community Heating Study to find lower carbon alternatives to conventional gas or electricity heating systems, which will also provide cheaper heat for London's homes and businesses.
- An increase in the use of renewable energy in London. The city should aim to generate 665 GWh of electricity and 280 GWh of heat, from up to 40,000 renewable energy schemes by 2010. This would generate enough power for the equivalent of more than 100,000 homes and would heat more than 10,000 homes.

The Energy Institute welcomed the publication of the Energy Strategy. The EI played a part in its development by organising consultation on behalf of the GLA to facilitate debate among energy stakeholders.

Copies of the Strategy, its highlights document and the leaflet are available from the Public Liaison Unit at the GLA, tel: 020 7983 4100, or can also be downloaded from the GLA website: www.london.gov.uk

Mayor Ken Livingstone launches the Strategy

Global warning for ignorant investors

The majority of UK institutional investors are unaware of the fundamental impact which the imminent EU Emissions Trading Scheme will have on the value of their portfolios. So says the Carbon Trust while launching its 'Carbon Rationing' campaign to raise awareness of the economic implications of carbon rationing to City audiences.

A MORI poll commissioned by the Trust highlighted a lack of awareness and knowledge regarding the detailed risks and opportunities resulting from the physical impact of climate change and government's response to it. The key findings are that:

- half of investors claimed to know nothing about the EU Emissions Trading Scheme, which is fast becoming a strategic issue for companies covered by the scheme;
- over half of those polled believed climate change regulations posed a considerable commercial risk to UK industry over the next decade; and
- 87% of investors agreed that businesses needed help in understanding how environmental change and legislation would impact upon their bottom line.

Tom Delay, Chief Executive of the Carbon Trust, commented: "Climate Change is a fact. The physical impact of climate change coupled with policy and regulatory initiatives will have far-reaching and fundamental consequences for worldwide economic performance. How companies respond to climate change and how they communicate their strategies and tactics for dealing with it will mark out the winners from the losers in the years ahead.

"Our Carbon Rationing campaign has been devised as a way of raising awareness of these issues amongst investors and to remind them we are uniquely well-qualified to assist investors with information, analysis and insight on the inherent risks and opportunities to their portfolios. We hope this campaign will convince them that climate change has to play an increasing role in their analysis and valuation."

Windpower is likely to be the dominant renewable technology in the UK until 2020, according to a new report: *The Renewables Innovation Review* conducted jointly by the DTI and the Carbon Trust. But windpower alone will not have enough resource to achieve the estimated contribution that renewable energy will need to make in order to meet the Government's carbon reduction aspirations for 2050.

Both on and offshore wind could deliver almost all of the required growth to meet the 2010 renewable energy target, says the Review.

"We cannot afford to rest on our laurels," Energy Minister Stephen Timms said. "This report demonstrates the impact wind energy is set to have and confirms our view that the 2010 renewable energy target is achievable. But we must think strategically both about long-term policy and funding if we are going to exploit the full economic and environmental potential of our renewables industry."

The report concludes that all renewable energy technologies have the potential to make a material contribution to the Government's long-term carbon reduction aspirations – as set out in the 2003 Energy White Paper. It also highlights the important role that fuel cells may be able to play in delivering large carbon savings through improved efficiency.

But long-term policy measures and incentives will be important if a wide range of renewable and other low carbon technologies are to be deployed on a large-scale basis.

The report raises a number of issues for the long-term development of individual renewables technologies, including:

- the need to demonstrate the technical and commercial viability of wave and tidal projects;
- a focus on fuel supply development of biomass, through clusters of regional level projects; and
- developing a more coherent approach to building-integrated renewables such as solar PV.

The British Wind Energy Association (BWEA) welcomed the findings of the Review, adding that it correctly identifies that removal of institutional barriers to wind energy developments, both onshore and offshore, will be of critical importance to ensure that the 10% renewables target is met.

The previous week, the BWEA released figures showing that 22 new wind energy projects are to be built this year, totalling some 470 MW of additional capacity – almost five times the amount installed last year. By the end of 2005, the BWEA predicts that well over 1,600 MW of wind power will be installed, generating enough power for a million homes.

The Association also undertook a survey of five major developers, establishing their predictions for build in 2005. The results indicate further growth of the industry with a predicted 560 MW of projects being built onshore and offshore in 2005, taking new build over the next two years to over a gigawatt, with the wind industry supplying 1.3% of total UK electricity needs.

Marcus Rand, Chief Executive of the BWEA, said: "These figures are really encouraging as they show at long last that we have now entered the phase of delivery. The next two years will be critical for our industry. We must build up a significant head of steam so that we can deliver the build rates required to hit our national renewable targets and help in the fight to combat climate change."

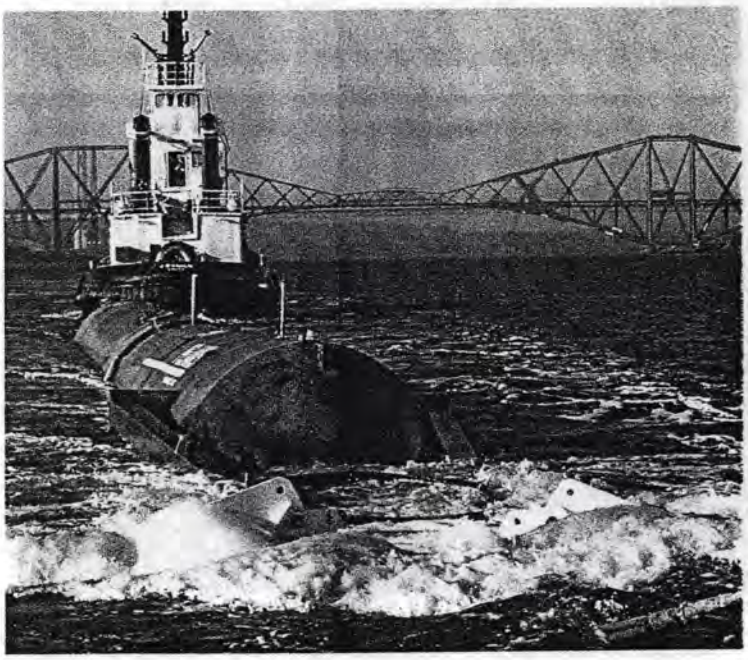
Pelamis wave energy converter goes to Orkney test centre

Ocean Power Delivery Ltd has completed the build and launch into sea of the first full-scale Pelamis Wave Energy Converter – said to be the world's first commercial-scale floating wave energy converter.

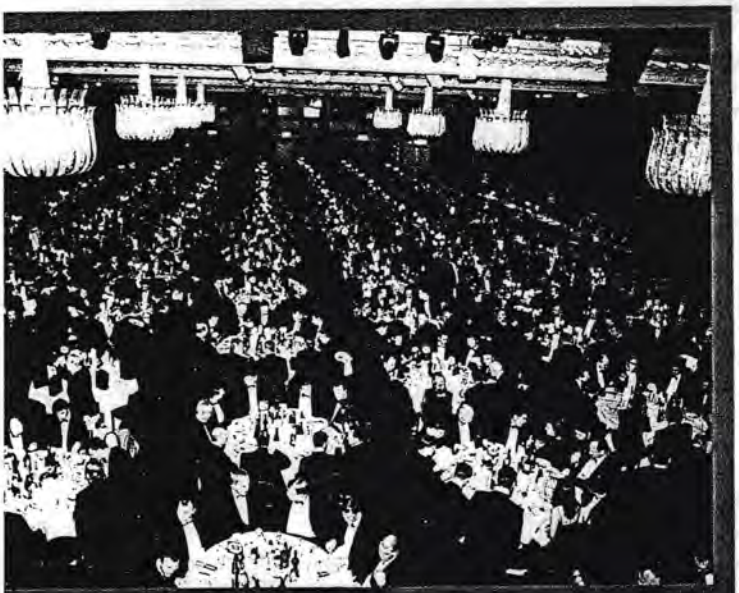
The 750 kW Pelamis machine measures 120 m long by 3.5 m wide (about the size of four train carriages) and weighs 750 tonnes fully ballasted. The machine was assembled and fabricated in Scotland, with over 90% of its content being sourced from the UK.

Build of the prototype has been supported by the DTI's New and Renewable Energy Programme. The machine is a pre-production prototype for subsequent commercial systems. The company expects satisfactory demonstration of the machine at the European Marine Energy Centre (EMEC) in Orkney to lead to orders for the first production machines.

Commercial partners from the UK and Portugal, with whom OPD are working to develop the first multi-machine commercial projects, were among guests viewing the machine following its arrival at the Port of Leith, Edinburgh.



The first full-scale Pelamis wave energy converter under tow



The Energy Institute's IP Week 2004 closed in February with some 2,500 oil industry executives having benefited from an intensive week of conferences and networking opportunities.

The increased importance of energy supplies from Russia and the CIS was recognised with a delegation of nearly 100 oil executives travelling to London to participate this year, with standing room only at many events during the week. Other highlights included the EI London Branch meeting, which saw a packed lecture theatre listening to a progress report on the Energy White paper by Joan MacNaughton, Director General for Energy at the DTI.

Wednesday evening saw the 90th IP Week annual dinner. During his speech, Energy Institute Vice President Dr Brian Hamilton highlighted the challenges ahead for the upstream sector if forecasts of a 20% increase in world oil demand by 2020 are proved correct. Dr Hamilton also praised the work of the Institute's technical team, quoting from a recent report that from an investment of just £2 million from 18 oil companies, the Institute's scientific and technical programme created savings for industry in excess of £42 million.

Landfill gas dominates first Renewables Obligation year

Energy regulator Ofgem has published the first annual report of the Government's Renewables Obligation, the main financial mechanism to support the development of renewable energy projects.

The Obligation requires electricity suppliers to source part of their electricity from renewable sources; the target started at 3% for 2002–03 and will rise to 10.4% in 2020–11. Alternatively, suppliers can use a buy-out clause which allows them to pay 3 p/kWh for any shortfall.

Out of 38 supply companies in England and Wales who had an obligation, 12 met their obligation wholly through producing Renewable Energy Certificates (ROCs), and nine suppliers paid 100% buy-out. In Scotland, 28 suppliers had an obligation, of whom16 met their obligation wholly through producing ROCs, with four suppliers paying 100% buy-out.

Seven suppliers failed to produce the required number of ROCs or make the full alternative payment to the buy-out fund prior to the 1 October deadline. Five of the companies have agreed to make voluntary payments to suppliers who had correctly produced ROCs. Ofgem is currently considering whether further enforcement action will be taken against the remaining two companies.

The report revealed some interesting statistics: the total Renewables Obligation for electricity supplied to customers in England, Scotland and Wales was over 9 TWh and some 50% of the ROCs issued were in respect of electricity from landfill gas, with on-shore wind accounting for another 20%.

Ofgem Managing Director Boaz Moselle said: "In the first year of the scheme's operation, Ofgem successfully accredited 505 generating stations, issued a total of 5,562,669 certificates for qualifying generation output and re-distributed a buy-out fund totalling £90,519,072. Implementing the Renewables Obligation, with all its complexities, has been a challenge for Ofgem and has created a great deal of administrative, technical and legal work."

Marine Energy Challenge to assess UK prospects

The Carbon Trust has launched the 'Marine Energy Challenge' as a way to assess the potential for marine energy devices to achieve a competitive cost of electricity generation against both other renewables and fossil-fuelled power generation, and to facilitate the emergence of the UK as world leader in the technology.

The Trust will be working with eight developers: Clearpower Technologies (WaveBob); Ocean Power Delivery (Pelamis); SeaVolt Technologies (Wave Rider); AquaEnergy (AquaBuOY); Lancaster University (PS Frog); Evelop (Wave Rotor); Embley Energy (Sperboy); Wave Dragon (Wave Dragon). The Carbon Trust also plans to carry out work such as tidal stream and marine energy design codes and standards, to supplement the direct technology assessment.

Tom Delay, Chief Executive of the Carbon Trust, said, "As yet no country has taken a leading position in marine energy. A relatively small investment now could make a significant impact to the UK's competitive position due to the early-stage of technology development."

Recent research by the Carbon Trust highlighted the potential for the UK to become a global leader in marine energy. The UK is ideally placed because of its huge exploitable natural resources, a high concentration of early-stage developers, and significant indigenous human capital applicable to the development of marine energy.

The objectives of the Marine Energy Challenge are to:

- review devices and device concepts in order to establish the potential of wave and tidal devices to become cost-competitive;
- engage engineering design companies to produce detailed engineering reports, including design drawings, in order to assess wave and tidal viability to a higher degree of accuracy than has been done in the past; and
- in so doing, confirm whether electricity generation costs can be reduced, and if so, to transfer technology, build capacity in the industry, and move device development forward.

Mott MacDonald is to lead a team – comprising Sustainable Energy Research Group, Bourton Group, Oreada and Redfield Consulting – appointed by the Carbon Trust to review the future prospects for tidal stream energy generation in the UK and Europe.

The role of the team will be to look at the size and status of the global market for tidal stream devices and to assess whether there is sufficient foundation to fully develop a domestic industry. The team will investigate the long-term commercial viability of up to a dozen developers and their machines. It will look into the basic machine costs, the development potential, machine reliability and performance characteristics plus the cost of an energy farm based on many such machines located offshore.

Turbine warming saves time at Ironbridge

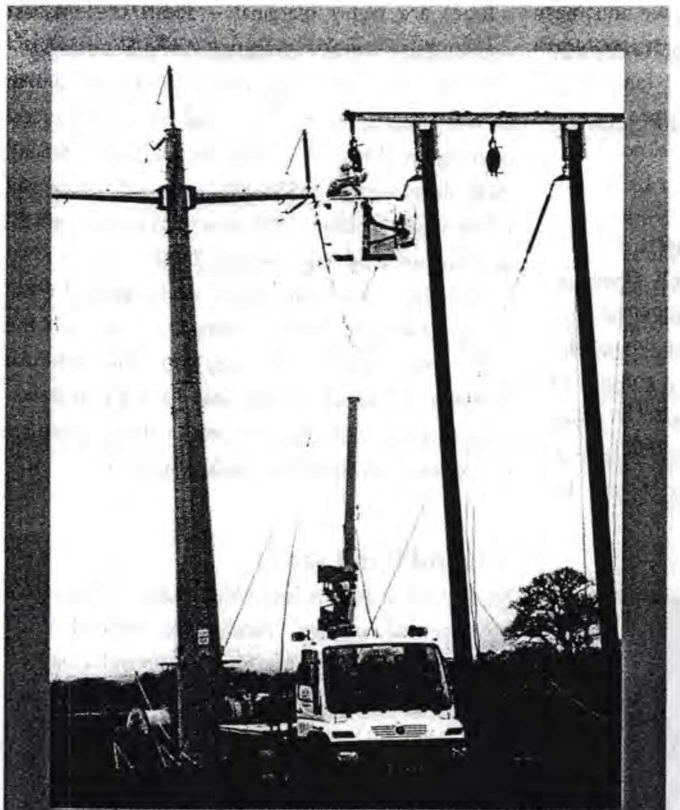
Turbine pressure warming (TPW) technology has been introduced at Powergen's Ironbridge Power Station in Shropshire to increase flexibility, reduce start-up time by up to 10 hours and to extend the life of turbine components. TPW enables the coal-fired station to operate flexibly and reliably to maximise its output.

The technique reduces the temperature driving force between the steam and metal turbine components during start-ups. This reduces the amount of stress in the metal while the temperature is raised from its shutdown temperature to its working value. Pressure warms are now always used after an off-load period of 24 hours or more, with the usual 'hot start' procedure is used for periods of less than 24 hours.

John Pacey, Plant Manager at Ironbridge, said: "Pressure warming allows us to synchronise a unit five or six hours after initial firing, then to load up at our normal ramp rate of 6 MW/minute to 200 MW, then 10 MW/minute to full load. Considering that it used to take us 12 hours from initial firing through to synchronisation, and then we had to ramp up at 1.5 MW/minute to 400 MW, then 4 MW/minute to full load it's clearly a big improvement, saving us around 10 hours."

The technique allows the station to begin a cold start and be at full load in between six and seven hours, compared to a more usual 18 hours under the old system. Ironbridge is the only station in the Powergen portfolio to use this technique.

Interior of the Ironbridge Power Station



Electricity contractor UK Power, now part of Alfred McAlpine Ltd, is using a fleet of Mercedes-Benz Unimog all-terrain vehicles to minimise land damage while carrying men and machines to working sites, and meet Health & Safety Executive regulations.

The Unimog U300, fitted with either insulated or non-insulated access platforms, is proving to be the backbone of the company's fleet – capable of driving on roads like a normal truck, and also across the most difficult terrain.

Two of the fleet are currently working near Burton-on-Trent, establishing a new overhead power line. This is the first time that specially designed poles, capable of carrying 132 kV, are being used instead of pylons. Where the line crosses a lake, special steel poles have been installed, but for most of the 6.6 km of the line, wooden poles are installed.

Squeezing the rocks harde

orth Sea oil is past the halfway mark – we have already produced a little more than is thought likely to be left in the ground. Production for the whole North Sea peaked back in 2000 at 6.4 million barrels/day (b/d). Production within Britain's share of the North Sea peaked the previous year at 2.9 million b/d, while Norway probably hit its high point (of 3.4 million b/d) in 2001. Countries with a much smaller share (Denmark and others) are expected to peak at around 0.5 million b/d this year or next.

So things have changed. The giant oil majors have been present in the North Sea for many years but are now selling assets and heading for pastures new – to be replaced by a series of smaller companies who see opportunities to operate profitably even with smaller production flows and smaller new finds.

Skrebowski asked the question: should we see a golden handshake to the departing majors or a golden opportunity for new, hungrier and more flexible entrants to usher in a reinvigorated North Sea? But first, how important was (and is) the North Sea globally, and what are the prospects for the region?

Limiting imports to Europe

The North Sea had very significant geopolitical roles, both to reduce Europe's dependence on imported petroleum and to put a limit on the power of OPEC. It also produced a great deal of income for European governments. But these effects inevitably wane with falling production and, soon, only Norwegian gas production will be expanding.

UK Continental Shelf (UKCS) oil and gas production has been declining since 2000 and the trend is forecast (by the UK Offshore Operators' Association – UKOOA) to continue steadily downwards. Production is likely to fail to meet targets set by the industry/government body charged with overseeing oil and gas in the UKCS, PILOT. UKOOA suggests that both 2005 and 2010 targets will both be missed – see Figure 1.

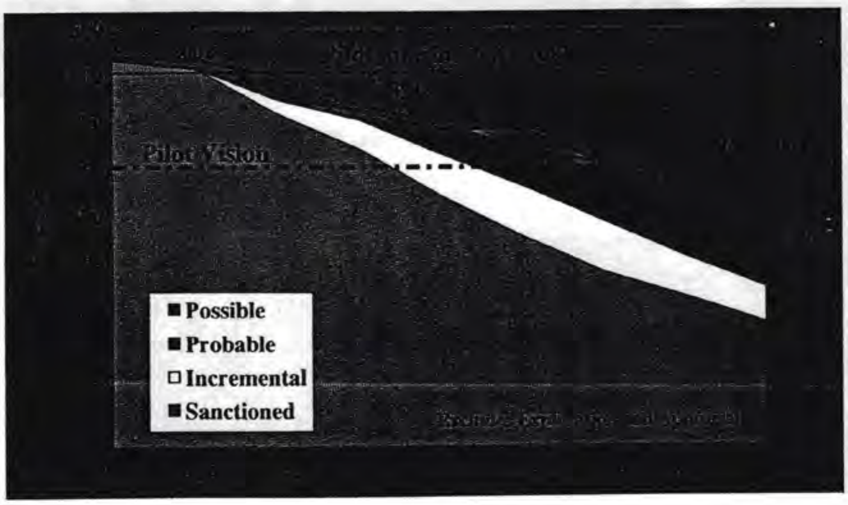
Britain will begin to be a net importer of liquids by 2006 or 2007, and a significant importer of gas by next winter (2004/05) – although, given the enormous seasonal swing in gas demand, Britain will export gas again at least for the summer of 2005.

The current state of the UKCS is one of large existing fields being mostly depleted and only a series of much smaller finds coming along to replace production. However, current discoveries of around 20–25 million barrels of oil equivalent (boe) are highly marginal – about the smallest economically worth developing, said Skrebowski.

Indeed the North Sea has entered the fourth of five phases common to all oil provinces: opening-up (1967–75 in case of the North Sea), rapid development (1975–90), maturity and peak (1998–2002), decline (1999 onwards) and eventual abandonment, perhaps around 2030.

All this is accompanied by a 'changing of the guard' among ,companies willing to work in the new environment. The key to the future development of the North Sea lies with smaller, new entrant companies for which these smaller discoveries are big news, said Skrebowski.

Figure 1. UKCS total production overview – 2003 survey



Second hand cars

So why is the North Sea still attractive, albeit to a new set of players. Skrebowski likened the departure of the majors and the arrival of new players to the process by which some people sell and buy cars. Someone who has been driving a large car for many years may decide that the vehicle is too costly to run any more, or might fancy something newer and faster. Or they may need the money that a sale would bring, or just don't want to drive any more.

Someone else might see an opportunity and have the skills to repair and tune the same vehicle, and to run it more cheaply.

The Government has a role to play in the transition too. It hopes to maximise production for as long as possible, in order to protect its revenues, and delay the resumption of imports. It is gradually improving the taxation regime for North Sea players to encourage them to stay, and has reduced bureaucracy – see box on the latest licensing round. The existing physical infrastructure is another incentive to new entrants companies – allowing them to squeeze the last possible production from existing or small new fields and get the product back to shore.

So what is left to play for? Figure 2 shows how remaining reserves – including as yet undiscovered reserves – add up to less than the oil already extracted. 'Brownfield' refers to 'squeezing the rocks in existing fields harder'. The likelihood of actually finding the 5–11 billion mboe of exploration potential is impossible to predict – it depends on who you talk to, said Skrebowski.

Surprise finds

Looking to future prospects, drilling for exploration, appraisal and development in the North Sea are all at historically low levels – except for a resurgence in 2003 that coincided with the arrival of new companies. Skrebowski quoted a recent report by Wood Mackenzie which said that companies had on average reached the point of spending as much money on exploratory drilling as the value (net present value) of the oil discovered. At this point, larger companies pull out, although new players at least have the opportunity to reduce costs and are likely to take a more positive view of further drilling prospects.

Of course, there may be surprise discoveries to be made yet. The recent start to the development of the new Buzzard field, which is expected to yield 400 million barrels of oil (see *Energy World* February 04), demonstrates that there is still oil to be found. Similarly Norway's Kristin field, where recent development drilling has added 10% to reserves. The Buzzard field is a 'stratigraphic trap' notoriously difficult to find, so there may be a few more – if exploration companies can afford to look for them.

But the UKCS is a fully mature province, so these new finds are bound to be infrequent, said Skrebowski.

The 'big four' companies: BP, Shell, ExxonMobil and Total still hold nearly half of the known reserves in the province. Meanwhile, newcomers are working the smaller discoveries, some carrying out new exploration drilling; some developing new or know accumulations; others are into speculative shareholdings and others are working on end of field life projects – squeezing the rocks further.

The North Sea has changed, but there are real opportunities for these new companies, said Skrebowski. The challenge is to add value in a mature province while the bulk of the infrastructure is still in place.

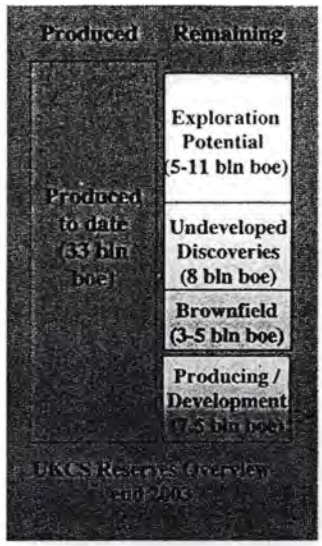


Figure 2. UKCS reserves

New licence to encourage activity west of Shetland

UK Energy Minister Stephen Timms announced in March a major new licensing round, and introduced another innovative licence, to increase the amount of oil and gas activity on the UKCS.

The new 'Frontier' licence is made available for the first time in the latest offshore licensing round. This new type of licence is designed to increase the amount of oil and gas activity in the West of Shetland region. Much of this region has not been offered for licensing in many years.

Under the 'Frontier' Licence, as with the already successful 'Promote' licence, the rental fee will be cut by 90% for the first two years compared to the rate for a traditional 'Production' licence. This, together with extended exploration and development periods will give companies an added incentive to find oil and gas in this new region.

The Frontier licence is on offer, along with the Traditional and Promote production licences, as part of the 22nd Offshore Licensing Round. The Frontier licence is only available in the West of Shetland region, the Promote licence is offered in areas excluding the West of Shetland and the Traditional licence will apply to all regions.

Stephen Timms said: "The new Frontier licence is just the latest move in our drive to maximise the potential of the natural resources along the UK Continental Shelf. Coupled with the other regions open for offer I am sure the 22nd offshore round will be a clear success. Neither should we forget the real opportunities still offered by the onshore area. I am delighted to offer all of the remaining onshore area and keen to see its full potential exploited."

The new licensing round has opened all of the UK onshore area and 1039 blocks and part blocks in the offshore area for oil and gas licensing opportunities.

Details of the acreage on offer under the 22nd seaward round and the 12th onshore round are available at http://www.og.dti.gov.uk

Taking the hybrid concept

By Nigel Horsley, RailPower Technologies Corp

ith hybrid (petrol or diesel with electric battery) automobiles selling faster than manufacturers can make them, it is, perhaps, no surprise that true hybrids have now arrived in the world of rail freight transport. A small Canadian company from Vancouver, RailPower, has come up with the 'emissions-busting' 2,000 horsepower (1,500 kW) equivalent Green Goat and its smaller, industrial yard version, the 1,000 horsepower equivalent, the Green Kid.

Their design incorporates tiny diesel gensets combined with enormous banks of recyclable long-life batteries, and the units are used for 'switching' (or shunting) railcars in freight railroad yards.

RailPower locomotives cut smog precursor oxides of nitrogen (NOx) and dangerous particulates (PM-10) by 80–90%. With the addition of post-treatment options, these levels can reach 98%. Field tests have shown that diesel fuel usage can be reduced by 40–80%, with a corresponding reduction in greenhouse gas emissions.

As an added bonus, the locomotives can be made ultra quiet, making them particularly suitable for use in rail yards close to homes and offices and in other places where noise is a major concern.

Invented by Frank Donnelly, Chief Technology Officer and founder of RailPower Technologies Corp, this transplanted Californian, had long seen a need for better economics and environmental performance in North American switch (shunting) yards.

"There are some 10,000 switchers in North America. The majority are very old, inefficient, and generally unsuitable for the stop-go idling environment of a switcher work cycle. Historically, large class one railroads have tended to cascade down their older mainline locomotives power into switching when they have basically reached the end of their effective service lives. We're talking today about switching locomotives that can be 30, 40, and even 50 years old.

Donnelly said that in the mid-90's he saw the North American industry taking very positive steps to reduce emissions. "But the solutions tended to focus on what I would characterise as being after the horse had bolted; that is either post-treatment options, or add-on electronics to reduce idle times. What we felt was needed was a front end solution for next year's Tier 2 emissions regulations – a new technological solution that would address the twin concerns of economics and environment all in one shot, and be cheaper to boot."

A cleaner, greener goat

Within two years, from concept to on the rail, the Tier 2 compliant hybrid appeared. With goat being rail yard slang for a switcher, it seemed appropriate that it be dubbed the Green Goat. Built on a GP-9 frame, its early testing showed the technology worked surprisingly well.

"I guess we were lucky with the concept proving true. The biggest surprise, though, wasn't hitting the low emissions numbers and the 40–80% fuel savings as we did, but the tractive effort improvement. In a subsequent trial at the Port of Los Angeles with Pacific Harbor Line, we demonstrated that one Green Goat could do the work of two conventional SW1200s. However, we had to increase the size of the diesel genset from 65 kW to one rated at continuous output of about 225 kW, with a standby peak capability of up to 240 kW. We also improved dramatically on the deep cycling capability of the lead acid batteries which raised the power rating to match the conventional switchers it replaces," said Donnelly.

The batteries are not sealed but valve-regulated. If one builds up gas pressure, it can vent safely. The size of the battery is a nominal 640 V, with 320 cells. It is 1,200 amp/hours capacity and weighs about 25,000 kilograms – half of this for the Green Kid.

"The reason this all works so well with the batteries is because of the average duty cycle. Typically, we only need 1 or 2% of the total time in the highest power setting. Most of the time the locomotive is operating, it is at idle, so there's plenty of time for the batteries to be charged to optimum levels," said Donnelly.

Regenerative breaking, a feature of hybrid cars, is therefore not worthwhile for switchers. However, it would make sense in a transit version, where it could create an appreciable power contribution braking into stations.

"We often get asked how long will the batteries last. The batteries, with average duty cycles, are rated for similar lifespans as good automobile ones. However, we anticipate that some may last considerably longer because of the way we manage the power. That management," he pointed out, "is very much embedded in our knowledge gained over the years from the trials, particularly the long first one."

A lengthy 18-month trial with North America's biggest railroad, the Union Pacific, involved both a summer and winter programme. Other trials have included the second largest railroad, the Burlington Northern Santa Fe, which ended in January, and one at

to the switch yards

the Marine Corps Logistics Base in Barstow, California.

"Again, we learned a lot about battery performance in high heat and extremely low temperatures too. The batteries will operate in 2004 at a Canadian site where we expect temperatures of –40°C. We feel good about our ability to maintain the batteries at these temperatures."

Wider applications

RailPower's Green Goat and Green Kid, while aimed at the North American switcher market, are anticipated to be evolved for the European and Asian markets.

"But," said RailPower President and CEO, Jim Maier, formerly with GE Transportation, "we do see this technology platform having application for transit and special purpose. While our commercialisation program for Class I and industrial rail yard markets is forging ahead, we are very cogniscent of the fact that this is a technology that can, potentially, bring significant improvements to passenger transportation in terms of operating and environment. The technology would appear to have a good fit for shortline operation whether it is freight or transit."

The Green Goat has been demonstrated in an 'emission-less' run of 50 miles on battery power alone.

"Clearly, it could be considered for such special purpose activities where exhaust fumes form conventional diesel electric locomotives create serious concerns. Typical examples are in tunnel operations, mining, and in very tightly controlled environmental facilities and factories."

Like their hybrid automobile cousins, the Green Goat and Green Kid, new technology takes time to be adopted. "In an industry as conservative as the railroads," said Donnelly, "the proof of the pudding, as the saying goes, is in the eating. They all want to try it our first before buying."

Reducing emissions in Texas

Now, some of those early trials are paying off. Atlanta-based Railserve, Inc, which had had a Green Kid trialled at the giant ChevronTexaco refinery in El Segundo, California, recently had six Green Kids and one Green Goat approved for funding under the Texas Emissions Reduction Program (TERP). This was quickly followed by approval for two more Green Goats under TERP in an application put in by Montreal's CANAC Inc. for Harris County.

The Houston-Galveston area has some of the highest air pollution in the US. It has until 2007 to meet the standards set by the Clean Air Act for ground-level ozone smog. In Houston itself, just under 10% of the NOx emissions come from railways.

"TERP has provided a catalyst for the swift introduction of this technology. This is precisely the purpose of this fund which has $130 million available annually for the next few years. Each of the nine recent successful applications will have the locomotive acquisition cost pretty well covered by the funding," pointed out Maier.

"It's hard to beat that, and we anticipate additional applications being made. In the meantime, our technology is also the subject of a small batch of applications with the Carl Moyer emissions reduction programme in southern California."

Two views of RailPower's hybrid [illegible] in switch yards

As for the future, Maier says that at some point there will be competition. "The economics are so extraordinarily persuasive that others will enter the field. However, we have a good lead, an aggressive patenting program, and efficiency of scale. By scale I mean we aren't burdened with huge overhead or bricks and mortar. By outsourcing manufacturing, as we are doing, we can turn on the production tap almost as fast as we can turn it off.

"This technology will be applicable for Europe. There, the subject of particulate emissions scarcely raises an eyebrow. However, those of us familiar with the fumes in Paddington Station in London or from the double-decker buses, find it perplexing to say the least. But, the trigger may not be primarily emissions. Noise appears to be a major concern in densely populated areas close to rail lines. The Green Goat is very stealthy in more ways than one," concluded Maier.

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Wood-fuel biomass

Freeing the bio-energy log

By Maurice Millar, NIFES Consulting Group and Michael Osborne, Scottish Woodlands Ltd

K Government policies on climate change continue to drive the development of the renewable energy marketplace. Unlike the 1990s, when the support for green electricity technologies under the fossil fuel obligations in Scotland, England and Wales, and Northern Ireland (SRO, NFFO and NI-NFFO) was specific to separate technology categories, now the focus is on lowest generating costs to satisfy Renewables Obligation targets. The emphasis remains on renewable energy for power generation.

The Energy White Paper of February 2003 recognised that the various renewable technologies are at different stages of development. We see proposals for ever-larger windfarms, as onshore wind energy continues to be the lowest-cost method of generating green electricity. However in the forestry sector throughout the UK, there is great interest in the development of bio-energy; particularly where this could be part of the timber production process.

Bio-energy power generation projects offer the prospect of annual fuel requirements of between 100,000 and 500,000 tonnes of wood-chips (at 45 to 50% moisture content (wet basis)) for power plants in the 10 to 40MWe range. The forestry sector has seen market prices for timber fall by almost 25% in the last two years, as recycled newsprint displaces pulpwood and recycled wood waste, subsidised by 'Packaging Recovery Notes' is used in the particle-board industry. As large quantities of commercial forestry become ready for harvesting in coming years, there is an apparent match between potential bio-energy demand and forecast forestry supply. The economic reality appears quite different.

Recent data on the use of renewable energy across the European Union (see Table 1) show that, for 2002, some 51% of renewable energy consumption was from bio-energy resources. Of this total of 512 TWh, France and Germany used 99 and 93 TWh respectively. The bio-energy figure for the UK for 2002 is 22.1 TWh.

UK statistics for 2002 from the *Digest of UK Energy Statistics* show total renewable energy supply figures, including data for wood and other types of biomass (see Table 1 again).

The total renewable energy supply for the UK is given as 37.23 TWh, or 3.201 million tonnes of oil equivalent (mtoe) of which bio-energy contributed 22.1 TWh (59%). This contrasts with total inland consumption of all primary fuels of 2,670 TWh (230 mtoe) and the 1,828 TWh (157 mtoe) of energy delivered to final users.

In electricity generation, the total production from all generating companies was 972 TWh (83.57 mtoe) and renewable electricity production contributed 28.8 TWh (2.47 mtoe) or 2.96%. Of this renewable electricity consumption, bio-energy contributed 16.64 TWh (58%) of the primary fuel supply.

With a clear target for 2010 of 10% of electricity supplied to come from renewable energy sources, there is substantial investment required in new generating capacity from renewables. The forestry sector is keen to see how bio-energy can contribute to this target.

Closer examination of Table 1 shows that most of the bio-energy used in 'green electricity' generation came from landfill gas, sewage gas, straw and poultry litter. The wood and wood waste categories of bio-energy were used in heat production.

Recovery of methane gas for power generation

Table 1. European bio-energy consumption data for 2002

	Bio-energy consumption TWh	Electricity generation TWh	Heat generation TWh	Industry TWh	Domestic TWh
European Union	512				
France	98.9				
Germany	93.0				
UK, of which:	22.1				
– wood	3.09		0.83	2.27	
– wood waste	2.37				2.37
– poultry litter, straw, meat & bone, SRC, farm waste	4.13	4.13			
– sewage gas	2.14	2.14			
– landfill gas	10.37	10.37			

jam

at landfill sites has been an effective way of disposing of a greenhouse gas of high global warming potential and a site hazard. Many generation projects were realised in the 1990s under the various rounds of NFFO and SRO. The future curtailment of landfill as a means of waste disposal and the increasing gate fees (driven by landfill tax increases) can be expected to restrict substantial further growth in this sector. Poultry litter resources are also finite and a significant proportion of these are already committed to existing power plants, such as the Westfield Biomass Plant in Fife.

The Renewables Obligations, introduced in April 2002, place a regulatory target on electricity suppliers to satisfy a set proportion of annual sales from renewable electricity generation (3% in 2002/03; 4.3% in 2003/04 rising to 10.4% in 2010/11). Penalties paid by suppliers on any shortfall from the set targets generate additional income for the renewable electricity generators. The annually increasing targets drive the investment in new renewable generation capacity.

Forestry to energy projects

Forecasts of commercial softwood availability show a potential resource peaking at 15 million m^3 (overbark standing) in 2017 to 2021. In addition, there is an unmeasured potential resource of hardwood in unmanaged woodlands and a further resource in the arisings from arboriculture. However, the softwood resource is only a potential availability. If timber prices remain depressed, then there is little economic basis for incurring harvesting costs. Wood-fuel prices are unlikely to provide an incentive to harvest if the underlying roundwood markets are not strong.

There is confusion in many parts of the forestry sector over this bio-energy 'mirage'. The perspective from the energy sector is of a plentiful fuel source available at waste-stream prices, utilising harvesting residues which are currently discarded when the industrial roundwood is produced. Conversely, forestry companies are being offered very low prices, which they see as unviable and insufficient to cover costs.

Nevertheless, bio-energy power generation projects are being developed in various parts of the UK. In April 2003, the DTI announced the award of £19 million from the Bio-energy Capital Grants Programme for five projects using energy crops and forestry residues; three are CHP projects and two are power generation only. This announcement

followed earlier awards for projects in Northern Ireland and Scotland. It remains to be seen how many of these seven schemes are fulfilled in due course.

Energy crops continue to attract attention and support. Co-firing regulations under the Renewables Obligations favour the use of energy crops in existing coal-fired power stations from 2009 onwards to 2016. As presently configured, the regulations will require an increasing proportion of the biomass component in co-firing to come from energy crops, with a minimum of 25% in 2009/10, increasing to 75% in 2011/12. This presumes the creation of the necessary energy crop fuel supply sources. This seems seriously adventurous, given that we do not have any wood-fuel supply infrastructure for the wood-fuel resources presently available in the forestry sector.

The business basis for power generation from forestry materials is still not clear. Prospective power projects seem to require low wood-fuel prices, which seem unviable from the forestry perspective and there is a gap between the minimum forestry price expectations and the energy sector's maximum cost expectations. Nevertheless, power generation projects offer the prospect of large, continuous demands for wood-fuel over many years and the forestry sector does need bulk commodity sales.

Recently, as part of a collaboration under the European Commission's OPET Programme, NIFES Consulting Group, in its role as OPET-Scotland, provided two wood-fuel seminars. The first was hosted by Forestry Commission Scotland and the second by the UK Forest Products Association. The

objective was to explain the workings of the energy sector to participants from the forestry sector; to bridge the apparent gap and work towards achieving an understanding of the issues and prospects. Some ninety delegates participated and heard presentations including an expert contribution from OPET partner VTT Processes concerning wood-fuel supply chain production methods in Finland.

The main focus for renewable energy development in the UK always seems to be on power generation – given the possibility to displace 0.43 kg of carbon dioxide by each kWh of green electricity supplied from renewables. Displacing fossil fuels in providing heating saves 0.25 kg of carbon dioxide from natural gas consumption or 0.32 kg of carbon dioxide from heating oil (assuming 75% efficiency in a gas or oil boiler). These figures are on a heat-supplied basis. Of course, there are orders of magnitude of difference between bio-energy consumption at power generation at plants of 10 to 40 MWe rating and dispersed boilers of 50 to 1,000 kW thermal rating.

A bio-energy power plant is about 28 to 30% efficient (on a net calorific value basis) in turning delivered wood-chips into exported electricity; about 70% of the primary energy is wasted. By utilising the available heat in a CHP plant the efficiency can be increased to over 80% in a well-matched example. Bio-energy CHP plants at industrial scale are being planned at various places.

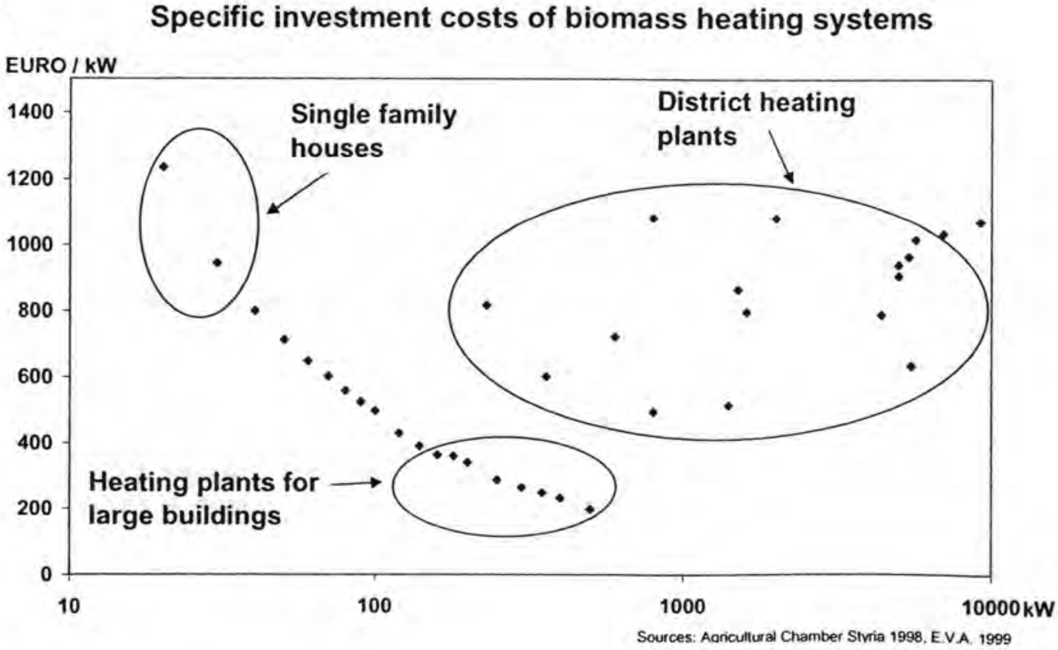
Heating applications in buildings

In addition to industrial-scale developments in bio-energy, there remain opportunities for heating applications in buildings. Analysis by the Austrian Energy Agency (EVA) has investigated the various types of bio-energy heating applications, using data from wood-fuel heating projects in Austria. Figure 1 illustrates how specific investment cost varies with project size. From this analysis, the conclusion is that the bio-energy market for heating buildings should concentrate on larger buildings where the investment opportunities are most attractive.

EVA also leads the BIOHEAT project – an international collaboration under the EC ALTENER Programme. Partners in the UK are NIFES Consulting Group and Green Land Reclamation. The BIOHEAT project seeks to promote wood-fuel heating in larger buildings.

From the energy sector perspective, the key issue in every wood-fuelled bio-energy project is the fuel source. Concerns over fuel specification,

Figure 1. Specific investment costs for biomass heating systems



consistent quality and security of supply remain hurdles to be addressed in every case. These are also business risks to be managed, given the lack of established competitive infrastructure for wood-fuel supplies – at small and large scales.

From the forestry perspective, 2003 was a year of quiet advances in the development of a wood-fuel market, despite the loss of one progressive wood-fuel energy services company. If all the projects spoken about come to fruition then the demand for wood-fuel will begin to develop.

Stimulus and barriers

Recent experience in addressing the divide between energy and forestry sectors has highlighted the need for each side to understand the business framework of the other and manage expectations as to prices and costs of wood-fuel. Whilst a growing range of new projects is being planned, it remains to be seen how many will progress to successful fruition.

Bio-energy is a technically-developed technology, as seen in practice in various other EU countries. However bio-energy is not yet a commercially-developed business in the UK, but we have a substantial energy resource already available in the mature forests under private and public ownership.

New business drivers will help to stimulate further interest in bio-energy. Industrial gas prices have risen by at least 30% in recent times and are forecast to continue to rise. The EU Emissions Trading Scheme will be introduced in the UK in 2005. This will impact upon power generation and other energy-intensive sectors. Use of bio-energy or other renewable energy sources will not count towards emissions allocations. The ROC mechanism has been extended from a target of 10.4% in 2010/11 to 15.4% in 2015/16, giving green electricity investors some assurance of further price support.

These developments in the energy sector will provide additional stimulus for renewed efforts to produce commercial bio-energy projects. The current impasse over wood-fuel prices is a hurdle to be overcome, not an indefinite barrier.

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Delivering fuel for co-firing

AEA Technology has launched a new venture in partnership with Climate Care to supply wood as a renewable fuel to power stations and the commercial and industrial sectors. Initially 'Biojoule' aims to exploit what it calls "an immediate large-scale opportunity to supply wood fuel for co-firing with coal in power stations." In the longer term, the company intends to diversify into wider markets for heat and electricity.

Biojoule's first production plant in East Anglia is now fully operational and producing 15,000 tonnes a year of wood specially manufactured for burning in coal-fired power stations. Extensive trials have enabled Biojoule to set up and patent a process to produce a dry, low-dust granular wood product that burns well and is easy to handle, says the company, which has successfully burnt the material in four power stations.

The Biojoule fuel is processed from virgin wood straight from the forest, which means that Biojoule wood is not contaminated with any waste materials. It can be delivered daily to power stations. The UK-grown product contrasts with imported fuels, which can involve transporting unusual wastes like olive stones or palm nut kernels over long distances.

According to Marcus Gover, Managing Director of Biojoule, "The UK electricity supply industry must meet its renewable targets or face heavy fines. Biojoule offers a viable wood fuel that can be used as a partial replacement for coal (co-firing) in existing coal fired power stations. We offer generators locally grown wood fuel, processed so that it can be handled and burnt easily at the power station."

Co-firing is the partial replacement of coal in coal-fired power stations. Biojoule wood fuel can be used to replace up to 5% of coal used by coal-fired power stations to generate electricity. This could potentially save up to 2.5 million tonnes of coal. This translates into potential savings of up to 7 million tonnes of carbon dioxide – a 1% reduction in total UK carbon dioxide emissions and 10% of the UK's Kyoto target.

Replacing coal for combustion at the power station, the use of Biojoule would provide income from both Renewable Obligation Certificates (ROCs) and Climate Change Levy Exemption Certificates (LECs). In addition, the reduction in carbon emissions achieved through co-firing Biojoule will reduce the cost of compliance with the limits being established under the EU Emissions Trading Scheme. When all these elements are taken into consideration, each tonne of the fuel could save generators £115 says the company.

The encouragement and development of energy crops is a key part of Biojoule's strategy, and the company says that significant investments have already been made in this area. Biojoule is currently recruiting farmers to grow coppice in the vicinity of its proposed processing sites. The company aims to have sufficient coppice planted to allow it to offer power stations a wood product that will be eligible for ROCs seamlessly through the 2009 date for switching to energy crops.

Contact Marcus Gover at Biojoule Ltd, tel: 0845 6010012 or via the website: www.biojoule.co.uk

Waste oil to biodiesel plant for Scotland

Construction has begun on a £15 million plant to manufacture biodiesel from waste oils for Scotland. Argent Energy has signed a £7 million contract with Mowlem to build the 45,000 tonne plant at Newarthill near Motherwell to provide a safe and effective means of disposing of used cooking oils and tallow.

Argent had previously announced that it is to receive major European funding, worth more than €3, to assist the company's research and development of biodiesel.

Safe and effective means of disposing of used cooking oils and animal by-products are becoming increasingly important in all EU member states. The project to build this plant presents an integrated solution which will recover a useful form of renewable energy from products previously considered as 'waste'.

A major subcontractor for the Argent Energy project is Austrian firm, Biodiesel International (BDI), one of the few companies in the world that produces technology for the conversion of oils and, in particular, saturated and unsaturated fats, into biodiesel.

Zero-emission fuel cell buses for 10 European cities

The UK's first fuel cell zero-emission buses went into service in central London in January. Three first-generation hydrogen fuel-cell buses vehicles are being trialled as part of a pioneering two-year European project to reduce air pollution and noise. The buses only emit pure water vapour.

The buses run on hydrogen gas, contained in six cylinders on the bus roof. The fuel cell system turns the gas into electrical power and the only emission is water, which forms a vapour cloud as soon as it leaves the exhaust and enters the atmosphere.

The trial, the largest project of its type anywhere in the world, involves nine other European cities. A joint venture between London Buses, DaimlerChrysler, BP, First and the Energy Saving Trust, the UK project will improve understanding of how well the technology performs in urban settings, and contribute towards the aims of the Mayor's Air Quality Strategy.

During the trial the fuel cell buses will be subjected to rigorous ecological, technical and economic analysis, and results will be compared with conventional buses.

London was chosen to trial the hydrogen fuel cell buses, specially developed by Daimler Chrysler as part of the European financed Clean Urban Transport for Europe (CUTE) project. Other cities include Amsterdam, Barcelona, Hamburg, Luxembourg, Madrid, Porto, Stockholm and Stuttgart.

BP is providing the hydrogen-refuelling facilities. The company is an infrastructure partner in five of the nine CUTE cities and is demonstrating a range of different hydrogen technologies in each location. The London project uses hydrogen sourced from natural gas. The Energy Saving Trust is supporting the project through grant funding from its New Vehicle Technology Fund programme.

DaimlerChrysler, through its subsidiary Evobus, has developed and manufactured the buses and will provide technical support during the trial, which is co-financed by the European Union.

London has three low-floor Mercedes Citaro urban buses with fuel-cell drive and a fuel cell gross power of over 250 kW. Their range is 200 km (125 miles) before refuelling is required. Noise levels within the fuel cell buses reach 60 dBA, compared to around 65 dbA for a regular Citaro vehicle.

The hydrogen fuel is sourced from natural gas and dispensed to the buses as a compressed gas. Nine tanks on top of the buses will hold 40 kg of hydrogen in total. Each 205 carbon fibre-wrapped aluminium tank is pressurised to 350 bar.

US partnership for energy-efficient freight

The US Environmental Protection Agency (EPA) intends to improve the energy efficiency of that freight transport, cutting air emissions along the way. The EPA's SmartWay Transport Partnership, unveiled in February, is a collaborative voluntary programme between the Agency and the freight industry that aims to improve the energy efficiency of freight through such actions as the better use of rail and the elimination of unnecessary idling of trucks and locomotives.

The partnership was started more than a year ago by 15 charter partners, including both major users of shipping – companies like Coca-Cola Enterprises, Nike, and Home Depot – and by major shippers such as FedEx Express and UPS.

At the recent unveiling, EPA Administrator Mike Leavitt welcomed 37 new partners, each of which has committed to measure and improve the efficiency of their freight operations. EPA estimates that the partnership will save 150 million barrels of oil each year by 2012.

UPS, which is one of the partners, set a goal last November of increasing its fuel efficiency by 3% by 2007. In 2002, UPS burned 0.1038 gallons of fuel per delivered package; the company aims to reduce that to 0.1008 gallons per package by 2007.

From oil crisis to climate challenge – 30 years with the IEA

The International Energy Agency (IEA) has published a report on its first 30 years in business. Born out of the infamous oil crises of the 1970s, the IEA has been documenting energy information in member countries ever since. Looking back, it seems that the 70s crises (and raised energy prices) were much more effective at controlling energy demand growth than government encouragement for energy efficiency during periods of more affordable supplies.

One of the major findings of the report: *Oil Crises and Climate Challenges: 30 Years of Energy Use in IEA Countries* is that IEA countries have significantly reduced the need for energy to fuel economic growth. Compared to 1973, it now takes one-third less energy to produce a unit of gross domestic product (GDP) in IEA economies. An important reason for this development is the considerable energy savings that have taken place in the various branches of manufacturing, in different end-uses in households and commercial buildings, and for different modes of passenger and freight transportation. The IEA analysis shows that without the savings achieved since 1973, IEA energy use at the end of the 1990s would have been 50% higher than it actually was.

Oil continues to dominate

Oil continues to dominate the IEA fuel mix. Yet since 1973 oil consumption declined in all sectors except transport. The fall in oil consumption was particularly strong in manufacturing, a result of both switching to other fuels and a strong decline in energy per unit of output. The gains in manufacturing resulted from improved energy efficiency and shifts to a less energy intensive structure.

The decline in industrial oil demand was offset by the growth in transport oil demand, so that IEA oil demand levels in 2001 were comparable to those in 1973. The most important reason behind the growth in transport demand is the increased use of cars for passenger travel. Car ownership levels have risen by 100% or more in many countries since 1973 and, while car engines have become more efficient over the years, cars have also become bigger, heavier and more powerful. This has served to limit improvements in average fuel efficiency. As a consequence, oil use for cars grew almost 50% between 1973 and 1998. Furthermore, oil use for freight increased by 80% over the same period, a result of strong growth in freight haulage and by a steadily increasing share of trucking, which is much more energy-intensive than rail and shipping .

Energy savings have slowed

"The report contains an alarming message: energy savings rates across all sectors and in almost all countries have slowed since the late 1980s, as has the decline in carbon dioxide emissions relative to GDP," said IEA Executive Director Claude Mandil. "This shows that the oil price shocks in the 1970s and the resulting energy policies did considerably more to control growth in energy demand and carbon dioxide emissions than energy efficiency and climate policies implemented in the 1990s."

Energy price developments offer some explanation of these long-term trends. Before 1973 prices were generally low. So, when prices surged after 1973, there was ample scope for improving energy efficiency as a response. But, as prices generally fell after the mid-1980s, there was less incentive to sustain energy savings rates. The lower prices, combined with the fact that energy intensities were already significantly reduced, resulted in considerably lower energy expenditures for both industry and private consumers from the mid-1980s. The energy share of total production costs in some industries fell by as much as 50% from the early 1980s until the late 1990s. Similarly, the share of energy costs for stationary uses in IEA household budgets fell by 20–50% over the same period, while the fuel cost per kilometre driven by private cars fell by between 20% and 60%, depending on the country.

Most IEA countries enjoyed significant reductions in carbon dioxide emissions per unit of GDP between 1973 and 1990, but after 1990 only a few countries saw a continued strong decoupling. While total emissions from IEA countries in 1990 were only marginally higher than in 1973, they increased by 13% between 1990 and 2001, a development that is in stark contrast to what is implied by the Kyoto targets.

Oil, electricity demand growing

The recent low rate of energy savings poses a concern from both an environmental and an energy security perspective. Oil and electricity demand is rapidly growing. Oil consumption is driven by strong growth in transport, while the use of various electric appliances and equipment in household and commercial buildings is propelling demand for electricity.

The increase in electricity demand will greatly add to the burden of controlling carbon dioxide emissions in IEA countries. Although nuclear remains at 11% of the total energy supply and renewables have started to make inroads for electricity generation, new generation capacity over the next few years will, in many IEA Member countries, be met by new fossil fuel-based power plants.

***Oil Crises & Climate Challenges – 30 Years of Energy Use in IEA Countries* may be ordered from IEA Books, e-mail: books@iea.org, website: www.iea.org/books.**

Facing the severe weathe

The winter storms and floods of autumn 2000, the widespread power disruption from high winds in October 2002, the flooding during Christmas that same year and the snow events of January 2003 have all provoked calls for explanations from politicians, the media and the public at large.

Each time the questions have been the same: "Why didn't we cope with the event when on the surface it did not seem that unusual?" In truth, the impact of a severe weather event may be reasonably well-understood, but the responses taken are not always effective. This is why performance can vary, even within the same industry.

In all sectors, emergency planning forums take place across the UK to co-ordinate responses. Yet it is left to individuals to assess the likely impact of an impending storm. However information available may be either insufficient, or of the wrong kind, to enable clear and confident decision-making about action.

For the energy sector a severe weather episode can wreak havoc with power supplies. Electricity distributors and suppliers need to be quick off the mark, take decisive action and put contingency plans into place immediately. But their plan of action can only be as good as the information on which they make their decisions.

East Midlands and October 2002 storms

East Midlands Electricity relies upon a distribution network comprising of over 24,000 km of overhead line, 44,000 km of underground cable and over 39,000 transformers to deliver electricity to its 2.4 million customers. Although EME has an excellent record of supply reliability, adverse weather conditions can very quickly cause severe damage to its electricity network, which can leave thousands of customers without electricity. So EME needs to act swiftly and efficiently to mitigate the impact of severe weather.

Jim Lightfoot, EME's Asset Operations Manager, responsible for overseeing the day-to-day management and performance of the distribution network, said: "Our customers want a 24 hour a day, seven days a week constant supply of electricity so we do everything we can to provide this even during severe weather. Inevitably, bad weather conditions will often cause damage and, as a customer-focussed organisation, we try to restore supplies as quickly as possible be it by repair, temporary local generation or by using alternative feeding arrangements.

"Therefore it is vital that we fully understand how severe the weather is going to be and how long it is going to last. In order to predict its impact and our resource requirements, we need to know when, where and how the weather will hit and what route it will take."

To help, EME turned to the Met Office, which has developed a web visualisation system for its customers. This graphical interface displays real-time satellite images and pressure charts, and looks at a number of meteorological elements, including temperature, wind speed and rainfall, to estimate the impact of severe weather. For energy companies like EME, web visualisation allows the impact of different types of severe weather, such as gale-force winds, lightning storms and ice accretion, to be assessed at a regional level. This ensures that the right people can be deployed in the right places, and call centres can be staffed to handle increased customer enquiries.

On 27 October 2002, winds reaching 82 mph hit the East Midlands area over a seven hour period. The Met Office provided EME with a faxed weather warning service, five days in advance of the storm and then notified EME of wind speeds of 50/60 mph on 25 October. Trialling the web visualisation tool, EME was able to understand the storm's impact on altitude and its regional variation. Armed with this information, EME predicted that there would be significant damage to the distribution network due to falling trees and wind-borne debris.

Two days in advance of the storm, EME was on full alert with increased standby provision for the weekend storm and had placed other staff on general alert. Customer support and field staff were moved to areas where the storms were anticipated.

Lightfoot said: "With web visualisation we were able to estimate the likely damage to the network, as well as predict the resources needed to ensure speedy repairs and reconnections were possible. Power was lost to 217,000 customers but over 50% of those affected had supply restored within eight hours of the storm passing. Working with the Met Office and web visualisation has enabled our most pro-active response to severe weather conditions to date."

Despite this type of response, British Power International's: *October 2002 Power System Emergency Post Event Investigation – Overview Report* for the DTI highlighted that there is still more work for the industry as a whole to do in estimating the relationship between forecast bad weather, physical damage to the network and the resources required to effect repairs and restore supplies speedily. The

By Nick Roberts and Danny Johns, Met Office

challenge

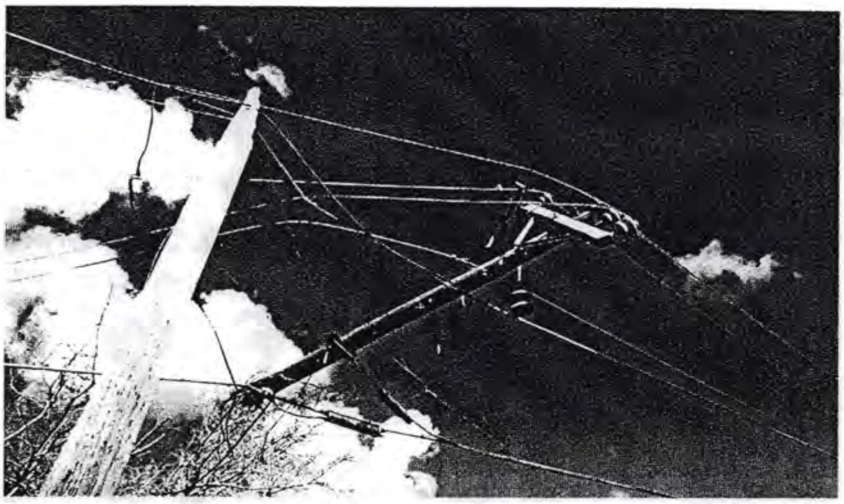
report also concluded that companies must continue to prepare for other severe weather events (such as lightning storms, ice accretion on overhead lines, flooding) which have different implications for the network planning, design, construction and maintenance regimes.

Providing intelligent information

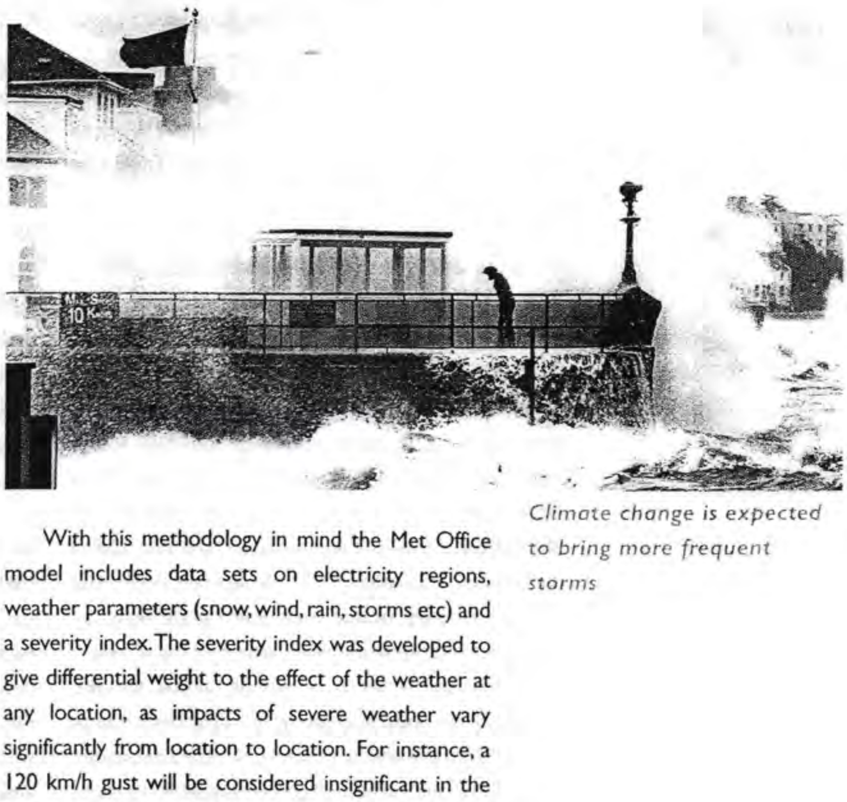
The Met Office has long understood the need for more intelligent information to be provided alongside its traditional forecast services. In 2000, it formed a consortium, principally involving Posford Haskoning and ADAS, which developed a model to understand the impact that a severe weather event has upon the UK as a whole. To achieve this, many sectors were analysed and then modelled, including the distribution of electricity. The model not only looks at the likely damage but has the capability to also look at issues such as manpower costs and levels of mitigation. These are then combined to give a cost-benefit analysis of any action taken.

The Severe Weather Impacts Model (SWIM) is able to gauge the overall effect of a severe weather event, or give more detailed impacts down to postcode area. These impacts can vary greatly, even over small distances, due to the type of housing in an area or the number of overhead power lines. At the postcode level of detail, resource allocation and mitigation become a real possibility.

During the development of SWIM, the consortium realised that it could take two approaches. First, it could develop a model which would include data on past severe weather events to make general predictions – but this would not take into account the rarity of severe weather events or climate change. The consortium therefore decided to look at the vulnerability of physical assets that are impacted by a severe weather event. For example, by including real-time forecast data and statistical information on residential housing, they would be able to assess how many buildings of a certain age would be damaged by high winds.



Weather-damaged distribution lines



Climate change is expected to bring more frequent storms

With this methodology in mind the Met Office model includes data sets on electricity regions, weather parameters (snow, wind, rain, storms etc) and a severity index. The severity index was developed to give differential weight to the effect of the weather at any location, as impacts of severe weather vary significantly from location to location. For instance, a 120 km/h gust will be considered insignificant in the Hebrides but would cause catastrophic damage in central London. Table 1 shows how the severity index was applied to the various parts of the UK, using the likely return period (eg a 1 in 15 year event) and the probability of each severe weather type. The differing impacts of 120 km/h gusts are shown in Figure 1.

During a severe weather episode, SWIM can assess damage to building fabric, equipment

Table 1. The severity index

Severity	Return period (years)	Chance in any one (years)
1	5	20–50
2	6–15	7–20
3	16–25	4–7
4	26–40	2.5–4
5	41–100	1–2.5

Figure 1. The severity of gusts of wind in the UK reaching a maximum of 120 km/h (65 knots)

Severity 5 ■ dark blue; severity 4 ■ mid blue; severity 3 ■ pale blue; severity 2 light grey; severity 1 ■ grey; does not register ■ black.

and infrastructure, and pinpoint losses down to postcode level. With this information, electricity suppliers could improve response times in a crisis by bringing in extra manpower to an affected area before gales arrive. Original data gathered through face to face interviews with electricity suppliers indicates that although response times vary, the optimum response for operations managers to mobilise staff with confidence is six hours.

Taking SWIM to the next level

Understanding how weather can affect you on a daily basis is a priority for operations managers. Yet, planning for future severe weather episodes is equally important. Operations managers can use SWIM for crisis planning by running through possible severe weather scenarios and assessing risk and then developing appropriate response plans. To demonstrate this to potential users, the Met Office simulated the October 2002 storms using SWIM. The model accurately located areas which would be hit by the storms, verifying the effectiveness of the model.

Currently SWIM is a generic model for the electricity distribution industry. The algorithms it uses can calculate the effects of strong wind, ice accretion, heavy snow and rain on electricity supply. To increase the model's effectiveness, it needs to include further data on the alignment of electricity networks and the number of customers at the end of the line. For example, if a supplier's network is aligned east-to-west, a strong northerly wind has the potential to bring the lines down, whereas a westerly wind would not have such a disastrous impact. This information could prove very useful to the industry as it is estimated that wind-blown damage has cost utilities industry over £202 million over the last 30 years.

The Met Office has also identified other variables such as tree cover, engineering standards, maintenance and network cable signs which have an impact and should be included in the model. By working with several network operators, the Met Office hopes to include, prioritise and rank these variables in order to take SWIM to the next level and build more sophisticated algorithms.

SWIM could also be used to understand the effects of climate change. The Met Office's Hadley Centre for Climate Prediction and Research estimates that weather events with a low severity rating could become more frequent in the future. Once the Met Office has definitive climate change figures, they will be included in SWIM to understand how suppliers need to adapt to climate change. The Met Office believes that the ability to model and adapt to a severe weather event today is halfway towards understanding how climate change will affect businesses in the future.

The Met Office is currently setting up a number of partnerships with electricity distributors such as Midlands Electricity. The purpose of these partnerships is two-fold, to make the network more resilient and to gain a more comprehensive understanding of the impact of severe weather on their network. The Met Office is also looking to work with National Grid Transco to develop algorithms which would be suitable for the electricity transmission industry.

There are other models available on the market but these rely solely on historical data. SWIM's unique selling point is that it includes relevant weather information and is constantly updated to include data on the electricity regions as they stand today.

Severe weather affects all sectors but its impact on the power network has a domino effect on the rest. For this reason, the Met Office is focussing on customising SWIM for the energy sector first and foremost. It aims to have an enhanced version of the model up and running by this winter.

Contact Nick Roberts, Met Office Utilities Manager, and Danny Johns, Met Office Severe Weather Impacts Project Manager at the Met Office tel: 0870 900 0100 e-mail: inquiries@metoffice.com

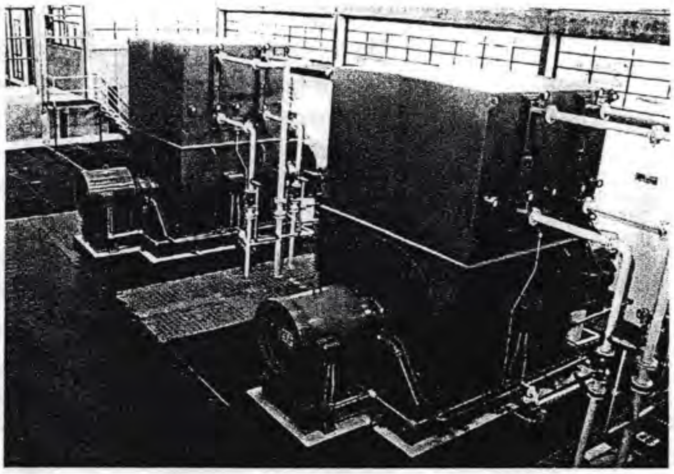
New generators for bagasse cogeneration project

bagasse-fuelled cogeneration plant in Brazil is being expanded with the help of Redditch-based WEG Electric Motors (UK) Ltd. The project involves doubling the generation capacity of the Santa Elisa power plant in Sao Paulo from 30 to 60 MW. To achieve this, WEG is providing a complete electrical package including two 15 MW generators, three 15 MW transformers, panels, cabinets and the complete automation system for the generation and distribution of energy.

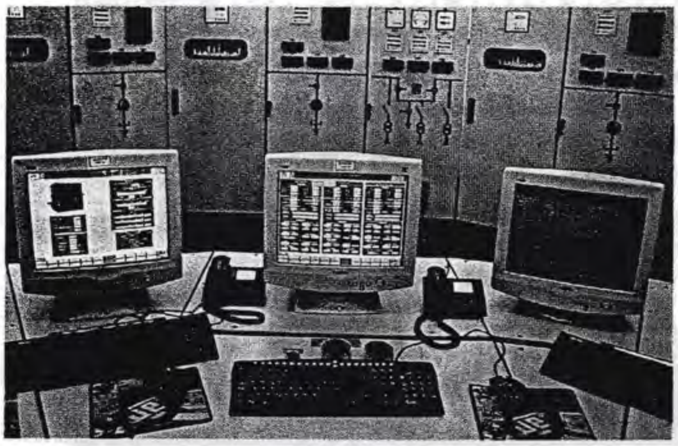
Half of the 60 MW capacity will be used on-site to process 35,000 tonnes of sugar cane a day – resulting in 1.5 million litres of alcohol, 3000 tonnes of sugar and 10 tonnes of wastes (bagasse – the raw material for power generation). The other half is sold to a local utility CPFL.

The use of sugar cane waste as fuel means that the generation process is highly economical, environmentally-friendly and extremely cost effective as any excess energy produced can be sold.

WEG, in conjunction with Electric Engenharia and CPFL, also supplied the upgrading substation (from 18.8 to 138 kV) and its power supply line and, in partnership with Sermatec, carried out the complete electrical installation.



The new bagasse-fuelled generators at the Santa Elisa power plant



The control room

The new system allows remote supervision and control of the whole energy generation processes. In addition to providing local supervision and control at the job site, the system allows quick, safe and simple monitoring and maintenance control via the internet.

Cost reduction to the customer is one of the main advantages of this remote control, since it avoids travel time and allows quick WEG diagnostic and support, whenever it is required, says engineer Edson Basquiroto, Application Software section head, of WEG's Automation Design department.

Companhia Energética Santa Elisa, of Sertãozinho, state of São Paulo, Brazil, is 60 years old and one of the largest alcohol plants in the world, employing over 5,000 people.

Contact Marek Lukaszczyk at WEG Electric Motors (UK) Ltd, tel: 01527 596748, e-mail: wegsales@wegelectricmotors.co.uk

High efficiency motors and could save 200 billion kWh per year

The European Union could save 200 billion kWh of electricity each year by improving the efficiency of electric motors and motor driven systems used in industry, according to a study published by the European Copper Institute. The ECI aims "to promote copper's benefits to modern society across Europe."

More than 60% of electricity consumed in European industry is used to power systems driven by electric motors, and is responsible for an estimated annual environmental cost to society of €6 billion. By improving energy efficiency, European industry could avoid the emission of 79 million tonnes of carbon dioxide each year. To achieve the same reduction by other means would require planting a forest the size of Finland (to transform the carbon dioxide into oxygen) or the installation of 1,800 km^2 of solar panels (to replace conventional power generation), says the Institute.

Europe's environment wouldn't be the only winner. The study shows that industry itself would save between €15 and €20 billion per year. In certain applications, energy savings could reach 50%, through investment in high efficiency motors and the use of effective control and maintenance systems. Saving 200 billion kWh of electricity each year would avoid the need to build the 30 new power generating stations needed to meet our ever-increasing demand for electricity. It would also achieve a 6% reduction in the EU's energy imports, adds the ECI.

Events

April

6-9 April
Economics and management of energy in industry
International conference, Lisbon, Portugal
www.cenertec.pt/ecemei

7-9 April
REAsia 2004
Conference and exhibition, Beijing, China
Details: Grace Fair International
Tel: +86 10 64390338
Email: vivian@gracefair.com

19-21 April
Making torque from wind
Conference, Delft, The Netherlands
Details: Delft University of Technology
Tel: +31 15278 5170
Email: conference@duwind.tudelft.nl

19-24 April
Hannover Fair
Technology exhibition, Hannover Germany
Details: Deutsche Messe AG
www.messe.de

20-21 April
Modernising central European electricity markets
Conference, Prague, Czech Republic
Details: Highbury Business Communications
Tel: 01322 611263
Email: s.linnell@highburybiz.com

21-22 April
IWEA 2004
Conference, Sligo, Ireland
Details: Irish Wind Energy Association
Tel: +353 71 9646072
Email: office@iwea.com

22-23 April
Energie-Cités
Conference, Martigny, Switzerland
Details: Energie-Cités
Tel: +33 3 81 65 36 80
Web: www.energie-cites.org

25-28 April
Electric Arabia 2004
Exhibition, Jeddah, Saudi Arabia
Details: Overseas Exhibition Services
Tel: 0207 862 2121
Web: www.montnet.com

May

2-6 May
Carbon capture and sequestration
Conference, Washington, DC, USA
Details: US Department of Energy
Email: carbonsq@exchangemonitor.com

10-12 May
Gasification
Conference, Brighton
Details: IchemE
Tel: 01788 578214
Email: rcragg@icheme.org.uk

11 May
Worldwide electricity R&D
Workshop, Brussels, Belgium
Details: Eurelectric
Tel: +32 2 515 1000
Web: www.eurelectric.org

11-14 May
WindEnergy 2004
Exhibition and conference, Hamburg, Germany
Details: Hamburg Messe
Tel: +49 40 3569 2123
Email: info@windenergy-hamburg.de

25-27 May
All-energy opportunities
Exhibition and conference
Aberdeen, Scotland
Details: Media Generation Events Ltd
Tel: 0208 241 1912
Email: info@all-energy.co.uk

25-27 May
Power-Gen Europe
Conference and exhibition, Barcelona, Spain
Details: PennWell Corporation
Tel: 01992 656616
Web: powergeneurope.com

situations/wanted

HEATING DEGREE DAYS
to 15.5C base temperature

	Region	Dec 03	Jan 04	Feb 04
1	Thames Valley	287	285	264
2	South East England	331	324	298
3	South Coast	274	297	271
4	South West England	247	244	261
5	Severn Valley	299	294	275
6	Midlands	325	323	292
7	West Pennines	327	310	282
8	North West England	375	379	307
9	Borders	322	316	283
10	North East England	374	321	287
11	East Pennines	333	323	285
12	East Anglia	324	336	297
13	West Scotland	346	322	312
14	East Scotland	349	338	309
15	North East Scotland	352	356	321
16	Wales	289	285	281
17	Northern Ireland	310	332	314
18	North West Scotland	312	324	309

For earlier data see http://vesma.com/ddd/history.htm

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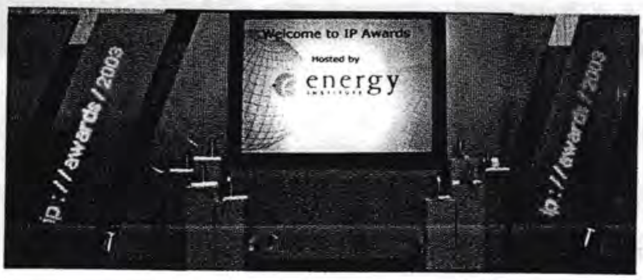

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