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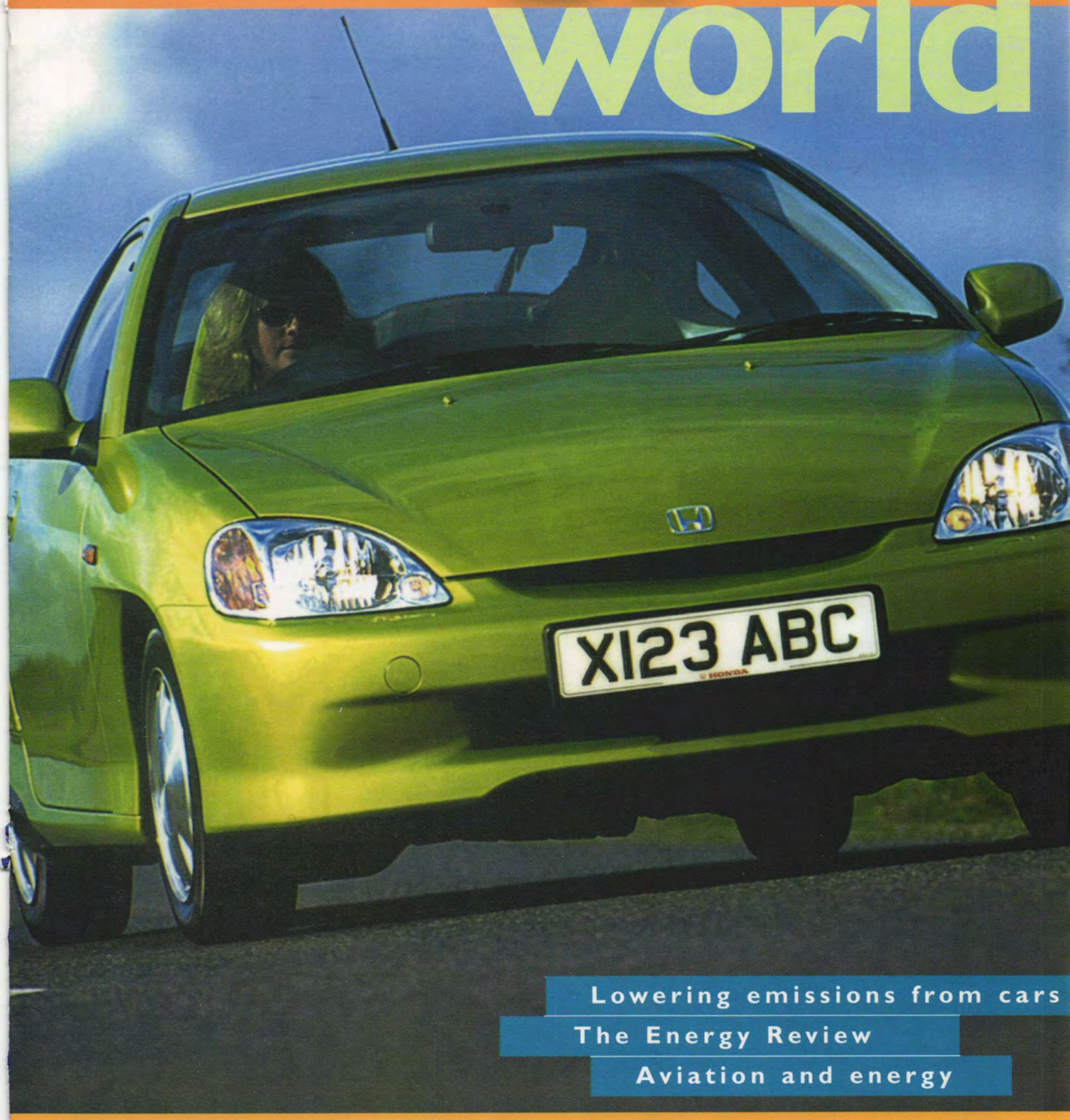

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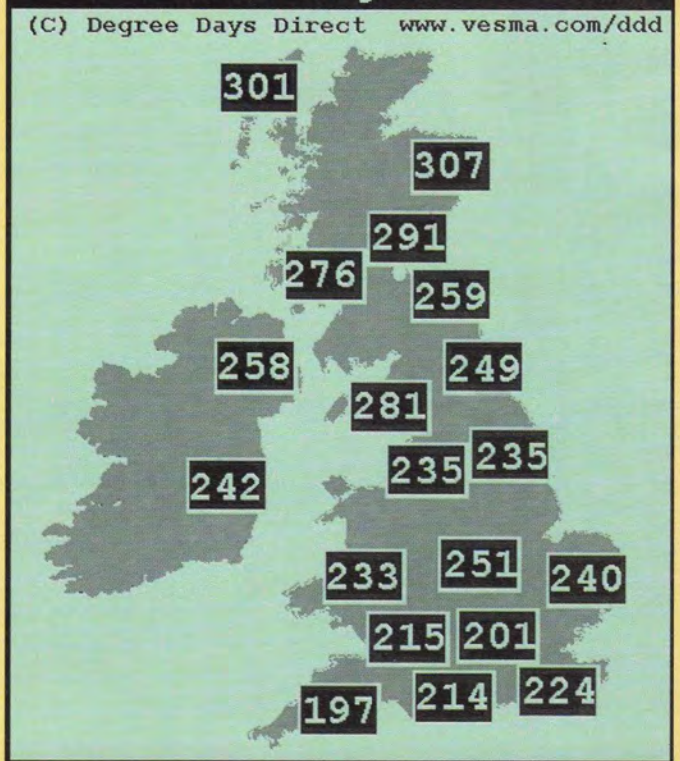

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Honda's hybrid petrol/electric Insight car is - by some way - the lowest emitter of carbon dioxide per kilometre travelled on UK roads. See page 16 for more news of 'alternatively-fuelled' road transport in the UK. In this issue on energy for transport, we also include articles on the scope to improve the efficiency of air travel, and take a look at a proposed new low-energy narrowboat design.

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Turning up the heat on the energy tricksters

Ann Robinson, Chair of energywatch

Gas and electricity consumer watchdog energywatch has launched a new campaign to stop the cowboy sales tactics used by energy companies. The 'Stop Now' campaign began after energywatch recorded over 5,000 complaints during 2001 about aggressive or dishonest selling on the doorstep, over the phone and on the street.

The scandal of sales malpractice by gas and electricity companies is not new. Since gas market liberalisation in early 1996, mis-selling has been wide-spread. energywatch receives about one million calls a year from people who want information or wish to complain about their gas or electricity suppliers.

When consumers call energywatch, they are first advised to try and resolve their complaint with their supplier. However, if this proves unsuccessful, they are invited to contact energywatch again. energywatch then takes up the complaint, officially registers it, and then tries to resolve the complaint using established procedures. The number of complaints that energywatch officially registers is therefore just the tip of the iceberg. Indeed, about 10% of the million or so calls received by energywatch each year relate to complaints about sales practice or techniques. In addition to the complaints received by energywatch, customers also complain to Citizens Advice Bureau, Trading Standards Officer, the suppliers themselves, and a range of other stakeholders who end up having to deal with the problems caused by the rogue sales agents of energy companies.

Three out of five of all energy consumers say they have been visited by a doorstep salesperson. Customers have complained to energywatch about the following experiences of energy salespeople, who:

- forge signatures and tell lies,
- bully and mislead people to sign requests for information, but actually get them to sign up for supply contracts,
- intimidate vulnerable people, and
- falsely claim contracts were agreed on the telephone.

energywatch wants to see the gas and electricity companies Stop Now! and put their house in order. To help this process it suggests:

- industry regulator Ofgem needs to keep and strengthen the operating licence condition about rules that energy companies should obey when selling to consumers (this was due to expire last month),
- Ofgem should use its fining powers,
- the energy companies should set up a rogues' register of sales agencies and individuals (in-house or agency employees) who fail to meet acceptable standards,
- gas and electricity companies should pay proper compensation to consumers for the distress and inconvenience caused by their sales malpractices, not just a refund of the bare minimum for financial loss, and
- there should be a standard format for energy supply contracts so that consumers are able to understand their own contract and compare it with those of other suppliers.

In the next steps of the campaign, energywatch will:

- publish COMPARE (company performance assessment review) which will include information on marketing complaints,
- work with the police to combat bogus caller crime,
- publish a definitive industry-wide report on mis-selling, setting out the standards which energywatch expects the industry to meet, and
- press for the setting up of a database of addresses, similar to those for fax, post and telephone services, which sales people are not allowed to visit.

It is extremely important that this problem be resolved. In order for competition to work, customers need to have confidence in switching. If customers do not have confidence to switch then they will not benefit from the good deals that are to be had.

The campaign also builds on a momentum for change. In January a report by the Committee of Public Accounts urged Ofgem to "curb high pressure and misleading selling techniques" used by suppliers.

In the end, it is not the volume of complaints but the distress and inconvenience caused to consumers that needs to tackled. One case is always one too many for the consumer involved. But it's examples such as Mrs Walsh of Dundee, who received a welcoming letter from a major supplier addressed to Mr Walsh, that attracts attention and really makes the case for change. The company claimed that a verbal agreement had been made and the appropriate bank details had been supplied. In fact, Mr Walsh had died some years ago.

Shocking as that case is, energywatch has other numerous examples of equally deplorable cases. For example, a 92 year old registered blind woman was tidying up the balcony of her flat when approached by a sales agent from another national supplier. Her son subsequently discovered she had been persuaded to sign a contract even though she could not see what she was signing.

Stopping this sort of distress and inconvenience to the consumer are worthwhile aims. The regulator and energy companies need to work with energywatch in partnership to stop them now.

energywatch - the gas and electricity consumer watchdog - was established by the Utilities Act (2000) to protect the interests of gas and electricity consumers. Consumers can call 0800 887777 for a range of leaflets or visit www.energywatch.org.uk.

Energy Review: welcomed as a 'step in the right direction'

Reaction to publication of the 'Energy Review', the final report of the Government's Performance and Innovation Unit (PIU) review of energy policy to 2050, has been broadly positive, if faint in places, with nearly all of the organisations involved finding something to welcome.

The review, the first major look at energy policy for many years, was commissioned last year by Prime Minister Tony Blair, who also welcomed publication of the report as: "a valuable contribution to helping the UK prepare for the challenge of changing energy systems over the next 50 years."

Key points from the report - at least those involving quantified goals - are new targets for:

- a 20% improvement in energy efficiency by 2010 with a further 20% improvement for the following decade,
- 20% of electricity to be generated from renewable sources by 2020 (this builds on the existing target of 10% by 2010).

Energy efficiency and renewables are likely to be the most cost-effective way of making large carbon emissions reductions, says the report, but options for both nuclear power and clean coal (with carbon sequestration) should be kept open.

Among reaction to the report, Friends of the Earth said that, while it points in the right direction, it is not the great strategic leap forward required; the CHP Association welcomed it, but stressed that the real test will be how the Government implements its recommendations; and the British Wind Energy Association expressed surprise at its "modest" recommendations.

Ofgem welcomed the recommendation that competition should be the cornerstone of future energy policy; the Carbon Trust said it puts the right emphasis on renewables and a new energy framework for growth; and the Major Energy Users' Council, while welcoming the new emphasis on renewables, added that the cost of renewables still needs to come down. The Petroleum Industry Association welcomed the call for action to improve energy efficiency across all sectors; while the Electricity Association said there was not enough emphasis on cutting emissions from the transport sector.

Meanwhile, nuclear fuels company BNFL welcomed the conclusion that action should be taken to retain the nuclear generating option for Britain - see also *British Energy, BNFL agree to study new reactor design* on this page.

The report will be followed by a new White Paper on energy from the DTI and DEFRA later in the year.

See also our full report on the Review on pages 8-12.

BE, BNFL agree to study new reactor design

British Energy and BNFL have signed an agreement on work to assess the feasibility of the Westinghouse AP1000 advanced pressurised water reactor design as a potential option to replace BE's existing UK nuclear power stations when they reach the end of their planned operating lives.

The agreement will involve BNFL/Westinghouse as prospective vendors and British Energy as prospective customers in an exercise to:

- assess the technical suitability of AP1000 reactors on existing reactor sites,
- prepare a business model addressing issues such as launch costs, economics and risk sharing, and
- document key factors associated with AP1000 and recommend an implementation strategy.

Speaking at the signing of the agreement BNFL's Chief Executive Norman Askew said "BNFL, through our Westinghouse business, has developed one of the world's most advanced reactor technology systems, the AP1000. This reactor design is ready for deployment now and we are delighted that British Energy want to pursue this option with us further. This agreement is the first concrete commitment from two companies since the publication of the PIU report and represents a significant step forward in the quest to build a replacement nuclear power station in the UK."

Critics of nuclear energy suggested that the plan to 'replace nuclear with nuclear' by a programme of bulk building based on one new reactor design was misguided and not supported by the Energy Review. Friends of the Earth quoted a paragraph in the Review report which calls nuclear power a "relatively inflexible source of carbon savings as a programme of series build would entail considerable investment in large-scale and long-lived plant."

More oil in Buzzard field

PanCanadian Energy Corporation has significantly increased its estimate of recoverable reserves on its Buzzard oil discovery in the Central North Sea, after drilling two additional appraisal wells on the structure. The company now points to 400 million barrels of recoverable oil within the southern and central parts of the Buzzard accumulation, up from the previous estimate of between 200 and 300 million barrels.

Alan Booth, Managing Director of PanCanadian Energy (UK) Ltd. in London, said, "These results confirm our long-held belief that the UK Central North Sea still holds significant rewards for companies committed to exploring in this prolific basin."

The increase in yield expectations has been said to represent the biggest North Sea oil 'discovery' since 1988.

'Community renewables' teams to aid local projects

The development of small-scale, community-based renewable energy projects is to be assisted by the establishment of ten 'Community Renewables' teams around the country. Launched by Energy Minister Brian Wilson, the new, £1.6 million initiative aims to help schools, offices and housing developments in England play a part in reducing the effects of climate change by adopting renewable energy technology.

The support teams will help local people and organisations devise renewable energy schemes suited to their area. The aim is to not only create environmentally friendly developments but to enable community groups to directly benefit from the income generated, says the DTI. Examples of the types of projects the initiative hopes to develop include turning waste from farms and food into gas to generate electricity for community buildings; using wood fired boilers to heat schools, and harnessing solar energy to power hospitals.

The local support teams, which are made up of local councils, energy experts, government bodies and other specialists will provide advice and training on feasibility studies, funding, technology issues, planning, environmental assessment and public participation.

Proposed community schemes can draw upon funding under the Government's:

- £20 million major solar photovoltaic (PV) demonstration programme,
- £10 million programme for renewable energy schemes with strong local community or household interest, and
- £5 million renewable energy budget for fuel poor households that are off grid or without mains gas connections.

Community Renewables teams have been established to serve Northumberland and Durham; Cumbria and Lancashire; north, west and south Yorkshire; Cambridgeshire, Norfolk and Suffolk; Shropshire and Herefordshire; the east Midlands; Gloucestershire and Wiltshire; Devon and Cornwall; Berkshire, Buckinghamshire and Oxfordshire; and Surrey, Kent and the London Borough of Croydon.

Meanwhile, Energy Minister Brian Wilson has announced a £2.9 million grant to develop the next generation of biomass combustion technology. The grant, which is the largest awarded by the DTI Renewables Programme for a biomass project, will support a £7.3 million development programme involving Alstom Power UK Ltd and First Renewables Ltd.

ETB chief executive has energy background

The first Chief Executive of the Engineering and Technology Board (ETB), Alan Clark, has a long association with the energy business. Clark, 51, who graduated in mechanical engineering from the University of Bath in 1973 and holds an MBA from the US, will take up the post this month.

Clark spent 13 years with General Electric, both in the USA and in Europe, where he was Vice President, Electrical Distribution and Control. Most recently, he was with Novar plc (formerly Caradon plc) as Chief Executive of their Intelligent Building Sector.

The ETB took over the promotional role of the Engineering Council in January with a brief to focus on the needs of the 'wider engineering and technology community'.

Alan Clark stressed his own engineering background: "Trained as an engineer, my career has been spent mainly in tackling the business issues in major corporations, but always with engineering and technology as the key drivers. I firmly believe that an appropriate engineering and science based culture is essential to national competitiveness and that the ETB has a key role to play."

Britain's first fuel cell CHP system has been installed and commissioned at Woking Borough Council's Woking Park leisure complex by BTU (Heating) Ltd of Guildford.

The new system, part of a private wire district energy system operated by the Council's innovative public/private sector energy services company Thamsewey Energy Ltd, supplies power and 100% pure water to the complex. It also supplies high grade heat for use in the space heating system, low grade heat to the swimming pool, and chilled water, via an absorption chiller, for air conditioning.

The system is designed to meet all of the leisure complex's energy requirements and generate excess power for export to other Council buildings including local sheltered housing. The fuel cell was manufactured in the USA by UTC Fuel Cells.

Capturing carbon would aid prospects

Coal-burning would impact on the environment far less if the carbon dioxide produced was captured and stored, possibly for use in enhancing North Sea oil recovery rates. And there is no case for the Government to support the building of a demonstration clean coal plant in the UK.

These are two of the main conclusions of a review of the UK's clean coal programme, which was published shortly before the Government's Energy Review.

Energy Minister, Brian Wilson welcomed the report, adding that "Coal still has a key role to play in generating electricity in the UK. But the way we extract power from coal must become kinder to the environment if we are to meet our commitments on reducing greenhouse gases and other polluting emissions. The biggest challenge for coal is the carbon dioxide it produces. This can be reduced in part through new technologies to increase the efficiency of existing plant. 'Retrofitting' these cleaner coal technologies to existing plant may also lead to export opportunities to countries such as China and India. In this way, British industry can help them use their vast coal resources in a more environmentally-friendly way for power generation.

Key conclusions arising from the review are:

- The environmental impact of coal plant could be significantly reduced by capturing and storing the carbon dioxide it produces. There is potential to use such carbon dioxide for enhanced oil recovery particularly in the North Sea, and in the longer term to store it in depleted oil wells, so as materially to reduce carbon dioxide emissions to atmosphere. There are however, a number of very significant legal, practical, environmental and commercial unknowns which need first to be resolved.
- The Government should explore ways of incentivising, for example, through carbon trading, the carbon dioxide savings which power generators can make through the use of cleaner coal technologies.
- There is no case for Government support for the building of a full scale demonstration plant. The evidence presented to the review was remarkably consistent in recognising that the technologies in question are already very largely proven. There may be a case for support to be given to the demonstration of cleaner coal technologies that can be 'retrofitted' to existing plant and DTI should widen the scope of its existing cleaner coal research and development programme to allow for this, as appropriate.

Meanwhile, an independent study commissioned by the Government has confirmed that there is no case for additional investment at the Prince of Wales colliery in west Yorkshire.

Mine owner UK Coal Plc had previously concluded that there are no economically accessible reserves left at the pit.

Brown 'goes cool' on green issues

The Government has failed to begin this Parliament with an imaginative and creative approach to the environmental tax agenda to match the commitment made in 1997. Few of the environmental tax measures contained in last November's Pre-Budget Report are significantly new, and the Treasury's strategy of "shifting the burden" of taxation onto environmentally damaging areas has stalled.

So says the latest report by the Environmental Audit Committee, Parliament's watchdog created to audit the Government's progress on sustainable development.

John Horam, the Chairman of the Committee, said "The Government's zeal for environmental tax reform appears to have fizzled out and the dead hand of the Treasury is in danger of damping further progress. It is also particularly outrageous that the Treasury is proposing to keep secret sustainable development reports submitted as part of Spending Review 2002. This will make it impossible for Parliament to hold departments properly to account."

US 'greenhouse gas intensity' plan will allow carbon emissions to rise

President Bush's new US initiative for addressing global climate change, unveiled in February, emphasises 'greenhouse gas intensity,' that is, the amount of greenhouse gases produced per dollar of gross domestic product (GDP) rather than the absolute amount of greenhouse gases emitted each year. The initiative sets a goal of reducing the US greenhouse gas intensity by 18% in the next ten years - from 183 tonnes of emissions per million dollars of GDP, to 151 tonnes per million dollars.

However, the White House statement acknowledged that the new initiative will merely 'put America on a path toward stabilising greenhouse gas concentration in the atmosphere in the long run'. The 18% intensity target will allow actual emissions to increase by an estimated 12% over the ten year period.

The initiative relies on a combination of voluntary emissions reductions, advances in energy technologies, and tax credits for renewable energy installations, energy efficient vehicles, and other energy technologies. The statement also promised a review on progress in 2012, with the adoption of additional action if targets were not being met.

Bush also announced a new 'Clean Skies' initiative for cutting power plant emissions of sulphur dioxide, nitrogen oxides, and mercury. The initiative proposes a system of tradable emissions credits that will lead to lower emissions, similar to the system already in place for sulphur dioxide emissions. If enacted into legislation, the initiative will mark the first time that power plant emissions of mercury have been regulated.

Environmentalists were predictably critical of the new initiative on climate change. The US-based Pew Center pointed out that while the use of greenhouse gas intensity minimises the economic impact of the measure by allowing emissions to rise and fall with economic output, it provides no assurance that a given level of environmental protection will be achieved.

The Center pointed out that US greenhouse gas intensity fell by 21% during the 1980s, and by 16% during the 1990s, due to a combination of factors including the transition from heavy industry to less energy-intensive, service-oriented industries. The new 18% target is therefore unambitious, says the Center.

Worldwatch President, Chris Flavin, while welcoming the move as a step in the right direction, added his concern "about the adequacy of the commitment being made and in particular that the administration plans to increase US emissions by at least an additional 12% in the next ten years. This will leave the US producing at least 35% more greenhouse gases in 2010 than would be permitted under the Kyoto Protocol. It is particularly disturbing to see the world's leading producer of greenhouse gases (producing 25% of the emissions with less than five percent of the world's population) propose to continue increasing those levels."

New pipeline to export Russian oil to Japan

Japan's Nippon Steel Corporation has engaged the UK-based AMEC to study the feasibility of a new oil pipeline to run from the Lake Baikal area in eastern Siberia to Vladivostock. The line, which would roughly follow the route of the Trans-Siberian railway line, would cross some of the harshest environmental conditions in the world, with extensive permafrost and temperatures below -40°C.

If built, the $4 billion pipeline would transport some 30 million tonnes of oil per year from Siberia to an oil terminal near Vladivostock, where it would be loaded onto tankers for shipment to Japan. AMEC's initial engineering study will identify the optimum route for the pipeline and the preliminary design of the pumping stations and oil terminal.

Part of the new onshore Malampaya gas plant was recently completed for Shell Philippines Exploration by Foster Wheeler. The plant is part of a deep water gas-to-power project. The $4.5 billion plant receives gas brought ashore at Batangas, Philippines, removes hydrogen sulphide from the gas and delivers metered supplies to three local power stations with a total electricity generating capacity of 2,700 MW.

The overall project represents the largest industrial development in the history of the Philippines, says Foster Wheeler, which won an 'outstanding contractor' award from Shell for its work in delivering the gas plant in 11 months. The project also signifies the start of the country's natural gas industry and should itself reduce the Philippines' dependence on imported fuel by 25-30%.

Wind power to lead renewables in Europe

Renewable energy in Europe will show a compound annual growth rate of 12% in revenues and 13% in installed capacity between 2001 and 2020, according to a new study by Frost & Sullivan.

"The European renewable energy industry is poised for robust growth, albeit showing significant variations in performance," said Frost & Sullivan's Harald Thaler, adding that the overall renewables market (wind, solar PV, biomass, small-scale hydro and geothermal energy) was worth $4.6 billion in 2001. Solar thermal installations account for a further $0.7 billion. Growth rates have been high over the past few years, and this trend will continue into the long term.

Based on the targets set by the EU's White Paper on a renewables strategy, launched in 1997 and aimed at achieving 12% of EU energy supply from renewables by 2010, the Commission finally adopted a new Directive on renewables last September. Establishing indicative targets for the consumption of electricity generated from renewables, the directive pushes for EU-wide production of 22% of electricity from renewables by 2020.

Galvanised by government incentives and subsidies for green energy, the introduction of green certificates and green tariffs and the decline in installation and generation costs, the EU's installed renewables capacity, excluding large hydropower plants, is set to reach 109 GW in 2010, says the company.

However, there is optimism that overall targets could be exceeded. Frost & Sullivan expects the wind power segment to outperform the White Paper target by nearly 30 GW.

IEA commends Norway's energy policies

The International Energy Agency has commended Norway's energy policies, while stressing the country's key role in international energy security. Launching a review of Norwegian policies, IEA executive director Robert Priddle stressed the importance of the country, as "the third largest oil producer in the OECD, after the US and Mexico, and the largest exporter. [Norway] is also the third largest supplier of natural gas to the European Union, after Russia and Algeria. Norway's policies have significant impact on the worldwide oil market and on the European gas market."

Oil and gas account for 40% of Norway's total exports and up to 16% of GDP, depending on world oil prices. Oil and condensate production is expected to be maintained at the current rate until after 2007, although about half of oil production is now from fields already in decline. Investment in these large declining fields is essential, says the IEA.

Under the Kyoto Protocol, Norway is committed to limit its greenhouse gas emissions to 1% above 1990 levels by 2008-2012. Emissions fell by 1% between 1999 and 2000, but they could be more than 20% above the target in 2010 if the current rate of economic growth is sustained. Oil and gas production and transport are the main sources of emissions.

Since 1991, taxation has been the main instrument used to limit carbon dioxide emissions in Norway, and tax rates are high.

In 1999, a commission of inquiry proposed a system for domestic emissions trading in greenhouse gases to meet the Kyoto target. The commission recommended that a system covering nearly 90% of Norway's greenhouse gases be in place by 2008. It also recommended that the system be part of an international market, and that it should replace the carbon dioxide tax.

Idaho Power's latest power station - the Evander Andrews power complex - was providing first power to the transmission grid in just 16 weeks from the start of construction by Innogy America. The new, 100 MW gas-fired plant in Mountain Home, Idaho, uses two 50 MW Westinghouse simple cycle turbines, and is capable of providing power for up to 60,000 homes, says Innogy.

Siemens gears up to build SOFC fuel cell units

The Siemens Power Generation Group (PG) is to install the first of a series of 250 kWe fuel cell cogeneration units at the Herrenhausen power plant in Hanover by 2003. Siemens is to install a SOFC (solid oxide fuel cell) plant to feed 225 kW of electrical energy into the grid operated by Stadtwerke Hanover and some 160 kW of heat into Hanover's district heating network.

The 5 million euro high-temperature fuel-cell power plant will have an overall efficiency of more than 80%.

The company is now establishing a fuel cell production facility at the former Westinghouse facility in the US, scheduled to begin production in 2003.

Setting course for the future

In the end, perhaps the fairest and broadest summary of the Government's Energy Review report is that it marks the beginning of the end for the previous laissez-faire, perhaps Thatcherite, policy - or lack of policy. While recent governments have been in agreement that energy policy is about some sort of balance between security of supply, cost-effective supplies, and environmental impact; most action has taken place on the pricing front. Despite plenty of rhetoric about the environment in general, and carbon dioxide emissions in particular; measures to help privatisation, liberalisation, deregulation, market reform, call it what you will, have generally held sway.

The Energy Review attempts to rebalance the equation in favour of the environment, while largely dismissing security of supply as an issue. Whether this rebalancing will be achieved in practice depends, of course on what the Government does with the report. The Government intends, after consulting us all on the contents of the report, to issue a new white paper on energy later in the year - that will be the moment when we know if it has been listening.

The most immediate priorities for future energy policy are to increase the use of both renewable energy sources - a new 20% by 2020 target is recommended - and to generate a step change in both energy efficiency and vehicle efficiency. Support for the nuclear power industry is limited to a call to keep the option open for a time when nuclear reactors can compete with fossil fuels.

The Review report is an impressive document - well-argued to an extent not always seen in such reports. Rather than tell you our version of what it says, we have reproduced on this and succeeding pages the key points from the executive summary, together with an edited version of the rest of the report summary.

In recent decades, the context for energy policy in the UK has been remarkably benign. The UK is currently one of just two G7 countries which is self-sufficient in energy. Energy prices have generally been falling in real terms, partly because world oil prices have fallen and partly because of the successful liberalisation of UK gas and electricity markets. UK industry and consumers, including the fuel poor, have gained. And the UK has found it easier than many other countries to achieve greenhouse gas reductions - the 'dash for gas' in particular (which was driven by commercial decisions) reduced carbon emissions from electricity generation.

The future for energy policy seems likely to be much less benign for two reasons:

- Issues of energy security are likely to become more important. The UK will become increasingly dependent on

Key points from the Review

The UK's future energy strategy should have the following elements:

1. Energy security should be addressed by a variety of means, including enhanced international activity and continued monitoring. However, there appear to be no pressing problems connected with increased dependence on gas, including gas imported from overseas. The liberalisation of European gas markets will make an important contribution to security;
2. Continued attention to long-term incentives is needed, though recent levels of investment in the energy industries have been healthy;
3. There is a strong likelihood that the UK will need to make very large carbon emission reductions over the next century. However, it would make no sense for the UK to incur large abatement costs, harming its international competitiveness, if other countries were not doing the same;
4. Keeping options open will require support and encouragement for innovation in a broad range of energy technologies. The focus of UK policy should be to establish new sources of energy which are, or can be, low cost and low carbon;
5. The immediate priorities of energy policy are likely to be most cost-effectively served by promoting energy efficiency and expanding the role of renewables. However, the options of new investment in nuclear power and in clean coal (through carbon sequestration) need to be kept open, and practical measures taken to do this;
6. The Government should use economic instruments to bring home the cost of carbon emissions to all energy users and enable UK firms to participate in international carbon trading. Achieving deep cuts in carbon would require action well beyond the electricity sector where cuts have been concentrated in recent years;
7. Step changes in energy efficiency and vehicle efficiency are needed, with new targets for both. In the domestic sector, the Government should target a 20% improvement in energy efficiency by 2010 and a further 20% in the following decade;
8. The target for the proportion of electricity generated from renewable sources should be increased to 20% by 2020;
9. Institutional barriers to renewable and combined heat and power investments should be addressed urgently; and
10. The Government should create a new cross-cutting Sustainable Energy Policy Unit to draw together all dimensions of energy policy in the UK.

In the light of this review, the Government should initiate a national public debate about sustainable energy, including the roles of nuclear power and renewables.

- energy policy review calls for more renewables and a step change in energy and vehicle efficiency

imported oil and gas. And the Californian energy crisis has highlighted the importance of getting incentives for new investment in energy right;

- The UK is likely to face increasingly demanding carbon reduction targets. A low carbon future, if it were to be adopted, could not be achieved on the basis of spontaneous changes within the energy system, especially when at present, one low carbon source, nuclear power, faces a progressive run-down as existing plant reach the end of their lives and are decommissioned.

The strategy articulated in this review thus has three main dimensions:

- Measures to address the security of the energy system;
- Measures to ensure the energy system is environmentally sustainable - these are intended in particular to create options to put the UK on a path to a low carbon economy; and
- Approaches which take full account of the potential costs of achieving the objectives of policy, in terms of higher energy bills.

Concerns about security need to be addressed

There are a number of reasons why security is on the agenda. These include:

- The Californian experience of electricity blackouts;
- Concerns resulting from the terrorist attacks in the USA of September 11; and
- The sensitivity to the UK's future need to import gas, possibly across long pipelines and from trading partners who seem to offer less security than we are used to.

There is general agreement that a diverse energy system - both in terms of types of energy and their sources - can benefit security. Some people argue that self-sufficiency is needed for security. But this is not necessarily so. As in other markets, imports can be a valuable means of increasing diversity and reducing risks - most other G7 countries already rely substantially on imported energy. Some submissions to the review have suggested that the Government should decide the fuel mix to be used for electricity generation. This review has rejected these proposals on the grounds that they would seriously distort the efficient functioning of energy markets.

CHP should benefit from the Review. The CHP Association called the report a useful step forward but added that "the real test will be how the Government implements the key recommendations".

Instead, the approach taken is to view issues of security in risk management terms. Some risks are essentially international, others domestic.

There are three main ways to safeguard security:

- To make maximum use of competitive markets to meet customers' needs. A key conclusion of the review is that the liberalisation of EU gas and electricity markets is important for energy security. Liberalisation would add flexibility and depth to European energy markets, increasing substantially the resilience of the energy system;
- To create a more resilient and flexible energy system. The review considers various options for enhancing the resilience of the UK energy system, including increased gas storage; greater use of liquid natural gas (LNG); and greater ability to use coal than would otherwise be the case, and
- To use international action to address global threats to energy security. On just about any scenario the UK will become more dependent on imports both for its gas and oil. There is little risk of there being insufficient gas available internationally: there is plenty, and 70% of the world supplies can be accessed from Europe. But the UK cannot be sanguine about the path that the gas will take from its source to the European market and the risks it may encounter *en route*.

Suppliers must face the right investment incentives

The other main area of risk to energy security is the set of issues which arise as a result of the Californian experience. Supplies of electricity were interrupted because insufficient investment had been made both in the network and in electricity generation. The Californian problems were very specific to that state and were due in considerable measure to failures in regulation, which have no parallels in the UK.

Present levels of capacity in the UK in both electricity and gas networks and in electricity generation are healthy. The processes of privatisation and liberalisation seem to have succeeded well. Even so, the situation needs to be monitored since future investment might be constrained if the wrong signals and incentives come through the regulatory structures.

A low carbon economy poses a major challenge

Looking to the longer-term, the central question for energy policy is the weight to be given to environmental and other objectives. The strong likelihood of a

stringent greenhouse gas target being adopted in the future is sufficient to justify giving the environmental objective a strong priority within future energy policy - especially since the energy system is the source of 80% of UK greenhouse gases and 95% of CO_2. Low carbon options also have the merit that, particularly where they are local and dispersed, they generally contribute to the security of the energy system.

Possible future energy worlds in 2020 and 2050 have been analysed using scenarios. Credible scenarios for 2050 can deliver a 60% cut in CO_2 emissions, but large changes would be needed both in the energy system and in society. Two opportunities stand out. Substantial improvements in domestic and business energy efficiency could be made, and there are prospects for significant improvements in energy efficiency in the transport system. Yet, even if these improvements can be achieved, and even if the electricity system was to produce no carbon whatsoever, a 60% cut in CO_2 emissions could only be met if we were also to go on to make very large reductions in the use of fossil fuels as the main means of powering future vehicles. This shows the scale of the challenge.

The Government will need to make decisions about its longer-term approach to carbon reducing policies in the light of the UK's international commitments. The Royal Commission on Enviromental Pollution (RCEP) has proposed that the UK should adopt a strategy which puts the UK on a path to reducing CO_2 emissions by 60% from current levels by 2050. This would be in line with a global agreement which set an upper limit for the CO_2 concentration in the atmosphere of some 550 ppmv. It would be unwise for the UK now to take a unilateral decision to meet the RCEP target, in advance of international negotiations on longer term targets. Greenhouse gases are global pollutants, and it would make no sense to incur abatement costs in the UK and thereby harm our international competitiveness, if others were not contributing.

Given the strong chance that future, legally binding, international targets will become more stringent beyond 2012, a precautionary approach suggests that the UK should be setting about creating a range of future options by which low carbon futures could be delivered, as, and when, the time comes. The focus of this review is on ways of creating new options, and building upon the options we already have.

A CENTRAL ROLE FOR MARKET INSTRUMENTS AND SUPPORT FOR INNOVATION

A centrepiece of any long-term carbon-reducing policy should be the use of market-based instruments to put a price on carbon emissions and to help determine the most cost-effective opportunities. This need not happen immediately, but decisions about long-term approaches are needed soon, since early commitment will start to influence decisions in many markets. A central aim should be to enable the UK to participate in international carbon trading.

A vital means of increasing the range of options for the future is innovation. This is a theme that needs to pervade all areas of energy policy and a range of policies should be directed towards it. The encouragement of renewables is one means of increasing innovation and new technologies.

Central to that process will be a stronger research and development (R&D) base. A group convened by the Government's Chief Scientific Adviser (CSA) has undertaken a review of energy research to inform this review. The findings of this group suggest there is a need for much greater investment in R&D if the cutting-edge technologies for a low carbon future are to be developed. R&D will not only facilitate the achievement of environmental goals but should create valuable export opportunities for British industry. A healthy R&D base is also necessary to attract and foster the scientific expertise needed by the new industries which will arise from the innovation it stimulates. The CSA's group suggested that a national Energy Research Centre should be established to provide the focus for such scientific activity.

A STEP CHANGE IN ENERGY EFFICIENCY IS NEEDED

Increased energy efficiency is obviously worthwhile if it saves money. There is no point in wasting energy that can easily be saved. The scope for cost-effective energy efficiency improvement is large and new potential will continue to be created by innovation. Major energy users have the incentive to save energy, but where energy is a small part of an individual's or firm's budget the opportunities are often ignored, partly because there are risks and bother involved in making the necessary investments.

This review puts forward a programme to produce a step change in the nation's energy efficiency. At the centre would be a new target - to ensure that domestic consumers' energy efficiency improves by 20% between now and 2010, and again by a further 20% between 2010 and 2020. This would approximately double the existing rate of improvement. It is a challenging proposition. The gains in terms of energy savings in a year could reach about 0.25% of GDP by 2020, over and above the cost of the investment needed to unlock these savings.

Combined heat and power (CHP) - which is sometimes viewed as a form of energy efficiency - is a low cost option for carbon abatement, but not zero carbon. In the long term, it will benefit from policies that put a price on carbon. Industrial CHP is a mature technology. It does not need support to encourage 'learning by doing' cost reduction, in the same way as new renewable technologies do. Yet it is important that current market and institutional barriers to CHP are removed - many of these barriers are similar to the ones confronting renewable investments.

AN EXPANDED ROLE FOR RENEWABLES

Renewables are not just a single technology but a highly flexible set of options. Some of these options will be developed under the existing Renewables Obligation. At the moment, the use of renewables nearly always costs more than the use of fossil fuels. Government support is justified for two reasons:

- Use of renewables will help the UK to

The British Wind Energy Association called the recommended 20% of electricity from renewables by 2020 "too modest - companies are already gearing up to generate this much from wind energy alone."

obtain carbon savings in the short term which helps in meeting international obligations; and

- Support for renewables will induce innovation and 'learning', bringing down the longer-term unit costs of the various technologies as volumes increase and experience is gained. In this way, today's investment buys the option of a much cheaper technology tomorrow.

In order to bring down the cost of new renewables and to establish new options, an expanded renewables target of 20% of electricity supplied should be set for 2020. The review estimates that meeting the whole of this 20% target could produce domestic electricity prices in 2020 around 5-6% higher than otherwise. The longer-term assurance which an extended target would give to the industry could, however, help to bring down the costs of supporting renewables over the next decade. The review has not come to a conclusion about the means by which the 2020 target should be delivered. This should wait upon the review of the working of the Renewables Obligation in 2006/07.

Achieving the existing target that 10% of electricity should be supplied by renewable energy by 2010 is by no means guaranteed. The renewables industry faces three institutional barriers that must be removed if it is to succeed. These are:

- The excessive discount which, following the introduction of the New Electricity Trading Arrangements (NETA), is currently imposed on the prices paid to small and intermittent generators;
- The urgent need to change the way in which local distribution networks are organised and financed; and
- The working of the planning system, which at present fails to place local concerns within a wider framework of national and regional need.

Recommendations are made to address all of these barriers.

MEASURES ARE NEEDED TO KEEP THE NUCLEAR OPTION OPEN ....

Nuclear power offers a zero carbon source of electricity on a scale, which, for each plant, is larger than that of any other option. If existing approaches both to low carbon electricity generation and energy security prove difficult to pursue cheaply, then the case for using nuclear would be strengthened.

Nuclear power seems likely to remain more expensive than fossil fuelled generation, though current development work could produce a new generation of reactors in 15-20 years that are more competitive than those available today. Because nuclear is a mature technology within a well established global industry, there is no current case for further government support.

The decision whether to bring forward proposals for new nuclear build is a matter for the private sector. Nowhere in the world have new nuclear stations yet been financed within a liberalised electricity market. But, given that the Government sets the framework within which commercial choices are made, it could, as with renewables, make it more likely that a private sector scheme would succeed.

The desire for flexibility points to a preference for supporting a range of possibilities, and not a large and relatively inflexible programme of investment, such as would be implied by the 10 GW programme currently proposed by the nuclear industry. If the UK does not support nuclear power today, the option will still be open in later years, since the nuclear industry is an international one, using designs that have been developed to meet circumstances in many countries. The desire for new options points to the need to develop new, low waste, modular designs of nuclear reactors, and the UK should continue to participate in international research aimed in this direction.

The nuclear skill base needs to be kept up-to-date. In particular, the Government should ensure that the regulators are adequately staffed to assess any new investment proposals. Action is also required to allow a shorter lead-time to commissioning, should new nuclear power be chosen in the future. Finally, within a new framework for encouraging a low carbon economy, the Government should ensure that, as methods to value carbon in the market are developed, additional nuclear output is able to benefit from them.

.... AND TO CREATE OPTIONS FOR COAL BY SEQUESTRATION

In the medium-term, coal has a continuing role to play in the energy mix. Its longer-term contribution depends on there being a practical way of handling the CO_2 that it produces. CO_2 capture and sequestration - whereby carbon is taken out of fossil fuels and stored:

- Could be a means to preserve diversity

of fuel sources, while meeting the need for deep cuts in CO_2 emissions;
- Has the potential to allow fossil fuels to be a source of hydrogen for transport and other applications without large-scale carbon release into the atmosphere; and
- Seems to be well suited to UK circumstances, since the UK has potential repositories in the Continental Shelf, and the carbon could possibly be used to get more oil from existing wells.

At the moment uncertainties surrounding costs, safety, environmental impacts and public and investor acceptability are large. Steps should be taken to reduce these uncertainties - as discussed more fully in the DTI Clean Coal Review. As part of this work, the legal status of disposing of CO_2 in sub-sea strata needs to be clarified, in the light of possible conflicts with the London and OSPAR Conventions.

Increased vehicle efficiency and new options for fuels are required

The transport sector is likely to remain primarily oil-based until at least 2020. Access to oil supplies is not a current concern. Nevertheless, the economy's dependence on transport, coupled with increased imports as UKCS production declines, reinforces the need to improve the energy efficiency of oil-driven vehicles. Prospective advances in vehicle technology hold out the possibility of significant reductions in fuel use.

The potential long-term requirement for significant CO_2 emissions reductions from the transport sector combined with the possibility that oil will become scarcer, raise the need to develop alternative fuels. There is the long-term prospect that the technology for powering vehicles by fuel cells fed on hydrogen will fulfil its current promise, and so ultimately provide a substitute for oil. Other options, such as liquid biofuels may also have a role. International efforts are needed to develop these technologies.

Handling the projected growth in aviation energy use and CO_2 emissions must become a priority. Taxation and other measures to manage aviation demand should be prioritised for discussion in EU and other international forums.

Institutional changes need to be made to deliver the strategy

The approach adopted in this review suggests that in the long-term the Government should be aiming to bring together the three interlinked themes in this review - energy policy, climate change policy and transport policy - in one department of state. In the shorter-term, consideration should be given to locating responsibility for energy efficiency and CHP policy with other aspects of energy policy.

As an immediate response to the challenge, the Government should set up a Sustainable Energy Policy Unit. This would be a cross-cutting unit staffed by civil servants from all the departments with an interest in sustainable energy, as well as staff from the Devolved Administrations, external experts and people from the private sector. The Unit would focus on providing ministers with cross-cutting analytical capability to ensure that key developments in energy use and supply were monitored and assessed. It would lead on the development of strategic policy issues, adapting quickly to changing circumstances.

In many parts of the energy industries, investors have found that their projects have difficulty in gaining planning permission. The attitude of local communities to proposals for new energy developments is important. They must continue to have their say in the planning process, which is one reason why it is important to engage the public in the energy policy debate. But national planning guidance needs to make it clear where there is a national case for new investment in energy-related facilities by establishing the relevant national and regional context for each type of development.

Next steps: a national public debate is now needed

The review develops a radical agenda - to enable the UK to put itself on the path to a low carbon economy, while maintaining competitively priced and secure energy. Precautionary action is needed in advance of further international agreement. Tasks that should be undertaken within the next five years include:
- Government should move towards a clear rationale for the balance of policy instruments - taxes, permits and regulation - to create powerful incentives for long-term carbon reduction; and
- Immediate action is needed to assist innovation and to create new options, and also to manage risk.

But these are not matters for the UK alone. Increasingly, policy towards energy security, technological innovation and climate change will be pursued in a global arena, as part of an international effort.

The implementation of an ambitious low carbon policy would be a demanding task. Change of this kind takes a long time. It would be wrong to imagine that everything can be "win-win": there will be some hard choices, and there will be losers as well as winners. For this reason, the Government needs to take the issues to the public soon. During the review, proposals were made to the PIU for an extensive process of public involvement. There was insufficient time for this, but it should constitute a central part of the implementation of the findings of the review.

The nation must not be lulled into inaction by the focus of much of the expert debate on long timescales and on energy systems in a future which will belong mainly to our grandchildren: the time for action is now and all players in the energy system have a role to play. Given that there is considerable inertia in the system, and that the low carbon technologies are not part of the conventional energy system, a change of direction will be difficult to achieve. It will require clarity of purpose in all parts of Government.

The report of the Energy Review is available to be read and downloaded at www.piu.government.uk/2002/energy/report

Practice what you preach for drives manufacturer

Control Techniques has proved the effectiveness of its energy saving message to industry .... in its own drives manufacturing unit at Newtown, mid-Wales. The retrofitting of an energy saving package, comprising a 45 kW Unidrive variable speed drive (VSD) and a system controller from EnergAir Enercon, to a twin bank of 45 kW compressors, is enabling the UK manufacturer to benefit from energy savings.

"The new system enables us to more closely match air supply to demand," said Bryan Richmond, Control Techniques' Environmental Engineer, who, together with Environmental Manager, Andy Clark, was the driving force behind the project. "The compressors supply our warehouse and PCB plant. Some machines in these areas run in standby when not in full production and have to be supplied with compressed air on a consistent basis. Previously, this meant that the compressors were running continuously - a lot of the time off-load, which is very wasteful."

The two new components, the VSD and controller, combine effectively to provide an air compressor management system, which acts to provide optimum efficiency at all times under all operating conditions.

The VSD acts as a balancer unit, continually topping up air pressure in the reservoir in response to changes in detected air system pressure to maintain an exact and constant pressure level. As air system demand falls, and more air is delivered into the air reservoir than is being used, the system pressure will begin to rise and the VSD compressor will reduce speed, and hence output.

Saving energy in its own factory - Control Techniques

Since installation, some months ago, the compressor management system has been registering savings equating to £4,800 per annum. These savings will result in a payback of around two years. Once this has been achieved all subsequent savings will be a direct profit contribution to Control Techniques' bottom line.

Contact Control Techniques Ltd, tel: 01686 612900, website: www.controltechniques.com

Cutting back on hot air

Combustion specialist Saacke and Omron Electronics have jointly developed a new digital combustion controller system in which various control components, such as drives and PLCs, can be slotted-in as appropriate for each installation.

Marrying digital controls to combustion air

Perhaps the most impressive controller installations are those that include an inverter to control the speed of the forced draft fan. Omron offers general and special purpose inverter drives from 0.1 kW to 300 kW, including a range specifically for fans, from which Saacke can select the optimum unit. These are used to control the speed of rotation of the fan, and hence the rate of combustion in the boiler.

Slowing the fan's motor down can save significant energy in itself, especially when they are sized to produce an airflow of 40,000 m^3/hr or more, which is not unusual in boiler systems. Often far more substantial is the saving achieved by optimising the rate of combustion in the boiler to meet instantaneous demand.

"Boilers are usually sized to satisfy peak demand, plus a margin on top for error, winter running, and to accommodate future growth of the system," explains Saacke's Dave Golden. "A boiler in a hospital or a car plant for instance will need its maximum capacity very rarely indeed, and could be run at say 50% peak for 70% of its duty cycle - a potentially massive contribution to carbon reduction and running costs.

Golden adds that his boiler controls tend to payback their purchase and installation costs very rapidly because combustion is innately energy hungry. "When it comes to inverters for forced ventilation fans, it is a rare one indeed that does not pay back in well under a year."

The digital combustion controller is a flexible design and can be configured to work in many different ways. Each has at their heart an Omron PLC which can be programmed to meet the specific demands of each installation.

Contact Omron Electronics Ltd, tel: 020 8450 4646

Aviation, renewables

by Martin Quick, Quick Technical Services

If predictions of the growth of aviation globally were to take place; if operating practices and aircraft technology were to follow present trends; and if kerosene remains the main aviation fuel, then a high proportion of the atmosphere's carrying capacity for greenhouse gases would be taken up by emissions from aviation. In addition to the greenhouse effect due to carbon dioxide, emissions at high altitudes of NOx, water vapour and condensation 'contrails' increase the overall greenhouse effects due to aviation - by a factor of up to three relative to burning the same amount of fuel at ground level.

In the future, the aviation industry could have a choice between major efforts to reduce its emissions by technical, fuel and operational changes or by emissions trading through buying emissions quotas. This article - the first of two based on papers given to a conference on 'transport in a renewable era' organised by the Institution of Mechanical Engineers and co-sponsored by the Institute of Energy - discusses some of the factors affecting these choices.

The IPCC report: *Aviation and the global atmosphere* mentioned above outlines a number of scenarios for global aviation growth. The greenhouse gas effects by 2050 of a relatively conservative scenario on a middle economic growth case are increased by a factor of 3.8 relative to 1992. The 1992 aviation effects were about 3.5% of all man-made greenhouse effects. Relative to the level of greenhouse gas emissions that have been said by the IPCC to be necessary to reduce the risk of catastrophic climate change (some 60% reduction, that is to 0.4 of present levels), this scenario for 2050 would represent about a third of the atmosphere's carrying capacity. Some of the larger projections of aviation growth would lead to greenhouse gas emissions from this sector alone exceeding the total global atmospheric carrying capacity.

The IPCC assessment has allowed for an improvement in fuel consumption per passenger kilometre by a factor of around two, but a recent report from the Society of British Aerospace Companies: *Air Travel - Greener by Design: The technology challenge* suggests this may be optimistic unless there are strong pressures to reduce greenhouse effects and/or fuel consumption.

The greenhouse effects of NOx and water vapour, at high altitudes are significant, although there are also major uncertainties. At 11 to 12 km the best estimate is that these produce about two-thirds of the total impact caused by all greenhouse gases including carbon dioxide. At lower altitudes, these non carbon dioxide effects become less important. Direct substitution of a hydrocarbon fuel derived from renewable resources (for example from biomass) would reduce the effects due to carbon dioxide, but at high altitudes this would be only about one-third of the total. Hydrogen fuels give a large reduction in NOx, and although at very high altitudes the increased water vapour emitted offsets the elimination of carbon dioxide effects, there is an overall reduction at all altitudes, but most marked at medium and low cruise heights.

OPERATIONAL AND FUEL OPTIONS

The next generation of passenger aircraft is likely to be dominated by 'conventional' swept wing aircraft. Some of these, such as the Airbus A380 will achieve reduced fuel burn per passenger mile by carrying very large numbers of passengers. Others, such as the 'Sonic Cruiser' concept from Boeing for a just sub-sonic aircraft designed for very long flight stages would be expected to be less fuel efficient.

While there are other concepts such as the blended wing-body and 'flying wing' configurations, unducted fan propulsion and schemes for boundary layer control, which could give significant efficiency improvements, these seem unlikely to be introduced in the near future.

If there are strong pressures to reduce the greenhouse effects from aviation in the medium term, some reduction in cruise altitude and the avoidance of very long stages (say more than 7500 km) would give significant benefits. While noting the uncertainties in the assessments, a reduction in cruise height from 12 to 10 km could reduce the greenhouse impact on a medium range aircraft (4000 km) by about 40% with relatively small effect in fuel consumption. Airlines are now developing non-stop flights of over 15,000 km (eg New York to Kuala Lumpur, London to Sydney). Completing a journey of 15,000 km in, say three sectors and at lower cruise heights, could reduce the greenhouse gas effects by around 60% relative to completing the journey in one stage, but even flying in two stages would give useful benefits.

The most straightforward application of renewable fuels for aviation would seem to be use of liquid bio-fuels derived from a number of possible crops. Depending on the energy ratio (energy in fuel output/energy in its production), this substitution would give a significant net reduction in carbon dioxide emissions by the absorption of carbon dioxide in growing the crops. Currently, the highest energy ratios achieved are of the order two. Liquid bio-fuels generally have a lower energy density than kerosene. However, ethanol as such is not attractive to the aviation industry as a jet fuel, but bio-fuels could be processed and blended into kerosene. For the small piston engine market, bio-ethanol can be used as a substitute for 100 octane gasoline.

Liquid hydrogen, which could be made from renewable energy sources, is possible aviation fuel, although it would require considerable changes to the aviation industry infrastructure and aircraft design. The volumetric energy density of hydrogen is much lower than kerosene (a factor of around four), although the energy per unit weight is much higher (a factor of around three). There is some loss in engine efficiency with hydrogen fuel, but this would be offset by reduced fuel load for

and the climate

very long range flights. The reduction in greenhouse effects compared with kerosene are considerable - of the order of 3.5 flying at a height of 11 km over a medium/long range for conventional aircraft. The greatest benefits come in very long flight stages. (In all these figures the uncertainties in non carbon dioxide emissions' effects must be noted).

Emissions trading

The UK Government consultation document: *The Future of Aviation* raised the issue of whether the trading of emissions permits should be allowed either internally within the aviation industry or whether airlines should be able to purchase emissions permits from other sectors of the economy. If aviation expands to the extent forecast as outlined above, it would seem unlikely that it could meet any reasonable limit on emissions purely internally, unless it makes major changes in operations, technology and fuel used. While the aviation industry should make all possible efforts to reduce its emissions, it may have to purchase emissions permits within the country in which it is based, and countries with large emissions may have to purchase quotas from other countries - so the costs would be borne by the industry.

The Royal Aeronautical Society has said it would expect the cost of saving an equivalent tonne of CO_2 in aviation to be many times more expensive than in other sectors, implying that buying emissions entitlements would be favoured by the aviation industry. A very rough assessment of the likely costs of hydrogen fuel derived from wind power at favourable sites bears out this conclusion, at least until the more cost effective greenhouse gas reduction measures have been exploited.

Charging for emissions is preferable to a fuel tax, as fuel use does not accurately reflect the emissions impact, and some operating changes which can reduce emissions (for example lower cruise height, lower pressure ratio in the gas turbines) actually use slightly more fuel. Further, the International Civil Aviation Organisation has deemed that fuel shall not be taxed. However, it appears to be willing to concede some form of greenhouse gas pricing if this were to be combined with emissions trading.

Effect of increase of costs

Assuming that pressures to limit greenhouse gas emissions become very strong in decades to come, aviation will bear extra costs, due to changed operating practices, the introduction of new technologies or alternative fuels to limit greenhouse gas emissions, or due to the cost of purchasing emissions permits. These costs would be reflected in higher passenger fares and freight charges.

The structure of air fares currently is extremely complex, but fuel costs represent about 22% of direct costs of passenger flights. This average figure must vary considerably between short haul and long haul flights, low cost airlines and other airlines etc. A factor of say three increase from today's low fuel cost would on average increase this cost by about 45%.

For business class passengers who are prepared to pay for the convenience of fast, point to point travel, the extra costs will be a relatively small percentage increase in fares. For low cost flights, the extra costs are likely to be more significant. The impact of increased fares could be some decrease (or slower growth) in business flying (maybe leading to an increase in video-conferencing) and a slow down in cheap holidays involving flying - especially long haul holidays. This could lead to greater valuing of places and attractions nearer home. For journeys of up to about 800 km high speed rail networks could be a viable option, with significantly lower energy use than flying. However, the driving force for a major transfer to rail in a crowded region like Europe or the east coast of the USA is likely to come from a shortage of take off and landing slots at airports.

Increased air freight costs could lead to more local production of goods that are currently carried by air. This could have advantages in some respects.

Conclusions

Constraints on greenhouse gas emissions, which are likely to intensify in the coming decades, will have a significant impact on the aviation industry. The response may include changes to aircraft design and operation, and the use of fuels from renewable sources to minimise emissions. In addition, international emissions trading and the use of tradable permits may be used to help accommodate the projected growth in aviation. Renewable energy sources, in the form of bio-fuels to blend into kerosene, or liquid hydrogen, are more likely to have a role if really large cuts in emissions are required or if oil prices rise by a very large factor.

The timescales for major changes in the types of aircraft in use are long. Thus, if we wish to reduce greenhouse gas emissions from the aviation sector by a large factor within the next 40 years, initial work has to begin very soon.

As engineers we are taught to think in terms of systems. Therefore, in addition to thinking about technical ways of reducing greenhouse effects of flying and institutional frameworks for offsetting aircraft emissions against other sectors, we should also be thinking of ways to provide the 'services' now provided by aviation in ways that may be less demanding on the environment - such as video conferencing for business meetings or rail travel for medium length journeys.

Last year's attacks on New York and Washington may have an impact on aviation - due to people's fears or due to the increased times for check in - particularly in the USA where internal flights have been very free of formalities. These events may also raise greater concerns about the stability of regions where much of the oil for the industrialised world comes from, giving a further incentive for promoting renewables. However, the long term impact is not at all clear.

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EC moves to replace 20% of petroleum by 2020

The European Commission has adopted an action plan and two proposals for Directives to foster the use of alternative fuels for transport. The Commission considers that the use of fuels (such as ethanol and biogas) derived from agricultural sources (that is, biofuels) is the technology with the greatest potential in the short-to-medium term.

The action plan outlines a strategy to achieve a 20% substitution of diesel and gasoline fuels by alternative fuels in the road transport sector by 2020 in the current 15 member States in the European Union. It concludes that only three options would have the potential to achieve individually more than 5% of total transport fuel consumption over the next 20 years: biofuels, which are already available; natural gas in the medium term; and hydrogen and fuel cells in the long term.

One proposed Directive would establish a minimum level of biofuels as a proportion of fuels sold from 2005, starting with 2% and reaching 5.75% of fuels sold in 2010. The EC also has targeted natural gas to replace 10% of petroleum-based fuels in the transport sector by 2020. The second proposed Directive would give member States the option of applying a reduced rate of excise duty to pure or blended biofuels, when used either as heating or motor fuel.

For natural gas and hydrogen, the Commission proposes to set up a contact group to advise on the introduction of the fuels, types of vehicles, geographical areas; fuelling infrastructure, and taxation. Participation will be sought from the appropriate industries and non-governmental organisations. Energy security and environmental protection are two of the key motivating factors in creating these new policy initiatives.

The European Natural Gas Vehicle Association (ENGVA) says that these initiatives demonstrate for the first time a legislative commitment in Europe to alternative fuels. If the Commission's target of 10% natural gas replacement of petroleum fuels by 2020 is met, it will mean 23 million natural gas vehicles (NGVs) on the roads in Europe consuming about 47 billion cubic metres of natural gas.

Hybrid petrol/electric is Britain's lowest carbon car

Honda's hybrid petrol/electric Insight car is - by a large margin - the lowest emitter of carbon dioxide per kilometre travelled, according to a new database launched by the car manufacturers' association the SMMT. Pictured on the front cover of *Energy World* this issue, the Insight emits 80 grams of carbon per kilometre travelled, well ahead of the chasing pack at 113-119 g/km. The car achieves over 94 miles per gallon running on unleaded petrol, according to Honda.

Aside from the 0.6 litre 'Smart' car, all the other places in the top ten are held by diesel-fuelled cars - see table.

The database also indicates that carbon dioxide emissions from new cars are falling. "Average carbon dioxide output fell by 1.8%, from 181 g/km in 2000 to 177.8 g/km by November 2001, confirming Britain's ongoing contribution to carbon dioxide reduction targets set by European car makers," says the Society of Motor Manufacturers and Traders.

In the first 11 months of 2001, 24% of all new cars emitted less than 150 g/km carbon dioxide - the threshold for the lowest VED rate - compared to just 8% in 1997. From this month (April) company car drivers with cars emitting less than 165 g/km carbon dioxide qualify for the lowest 15% tax liability. This proportion of the market is now a massive 48%, more than doubling the 23% share in 1997, adds the SMMT.

UK road tax, or vehicle excise duty, rates for privately-owned cars now vary from £90 per year for an 'alternative-fuelled' car with emissions below 150 g/km, to £160 for a diesel car emitting more than 185 g/km.

The Insight has also been labelled America's 'greenest vehicle' for each of the last three years by the American Council for an Energy Efficient Economy (ACEEE). The Insight beat the natural gas-powered Honda Civic into second place this year; with the Toyota RAV4 electric car third and Toyota's petrol/electric hybrid Prius in fourth place. The next six vehicles were all petrol-powered.

The two listings confirm that, both in the UK and the US, a greener alternative to conventional motoring is finally available.

TOP TEN LOWEST CARBON DIOXIDE EMITTERS IN THE UK

	Model	Engine	Fuel Type	CO_2 emissions g/km
1	Honda Insight	1.0	Petrol/electric	80
2	Peugeot 206	1.4	Diesel	113
3	Renault Clio	1.5	Diesel	115
4	Audi A2	1.4	Diesel	116
5	MCC Smart	0.6	Petrol	118
6	Seat Arosa	1.4	Diesel	119
6	Seat Arosa	1.7	Diesel	119
6	Vauxhall Astra	1.7	Diesel	119
6	VW Lupo	1.4	Diesel	119
6	VW Lupo	1.7	Diesel	119
6	VW Polo	1.4	Diesel	119

Ultra low gives way to no sulphur; or combine with biodiesel for lower carbon

Two new cleaner fuels: 'sulphur free unleaded' and 'sulphur free diesel' from BP have been available for a couple of months now from 18 filling stations in the Edinburgh area. The company is therefore well-placed to meet EU legislation requiring sulphur-free fuels to be widely available from 2005 and available from all sites by 2008.

BP had previously launched ultra low sulphur diesel (ULSD) in May 1999, and ultra low sulphur petrol (ULSP) in February 2000. Sulphur free petrol and sulphur free diesel are allowed to have a maximum sulphur content of 10 parts per million; an amount so small that it is barely detectable with the most sophisticated laboratory test methods, says BP.

The new fuels are produced at BP's Grangemouth refinery in east Scotland, the only UK refinery with the required hydrocracking technology. Despite higher refinery costs, the new fuels will be sold at the same price as BP's current ULS fuels, says the company.

Environmental benefits include the reduction of sulphur dioxide emissions that are a cause in the development of acid rain, and a reduction in particulate emissions that create air pollution and contribute to respiratory problems. The new sulphur free diesel reduces the amount of ultra fine particles expelled in the exhaust that can contribute to respiratory problems such as asthma - one of the key air quality issues that need to be addressed in cities.

BP has agreed to supply sulphur free diesel to First in Edinburgh for use in its 260-strong city bus fleet. The deal will include five First refuelling sites in Edinburgh and the Lothians, and involve 400,000 journeys every week, covering routes spanning the whole Lothian region.

Meanwhile Greenergy, the independent fuel supplier which claims to have been largely responsible for creating the market for Britain's ULSD market in 1992, has introduced 'carbon-certified' GlobalDiesel. The fuel is a blend of 5% biodiesel, processed from rapeseed oil, and 95% Greenergy Citydiesel (a ULSD). The combination gives GlobalDiesel the same local air quality benefits as Citydiesel, but with reduced carbon dioxide emissions of almost 5%.

Carbon-certification means that companies purchasing GlobalDiesel will receive documentation confirming the amount of emissions reduction over standard ULSD. The move marks the start of a new stage in the evolution of diesel fuel, says Greenergy, and purchasers from local authorities are already requesting the product for the purposes of building on their green fleet strategy. Hull City Council is the first UK local authority to buy the fuel.

GlobalDiesel can be used in all diesel vehicles without any modifications; is fully mixable with all diesels; has the same power and fuel economy as ULSD and meets all technical specifications for diesel adds the company.

Contact BP at bp.com
Further details of Greenergy Fuels at www.greenergy.com

Government guidance on transport and freight

The Government has brought together its published guidance on more efficient transport into a single comprehensive guide: *The road to more efficient transport* from the Energy Efficiency Best Practice programme.

Aimed at fleet operators and those managing business journeys, commuters, visits to hospitals, retail outlets etc, the new guide pulls together all the help and advice available from the programme.

The Government has also launched a bi-annual newsletter: *Freight future* which aims to help freight operators to find out how to improve their environmental performance. It contains information on current best practice in fuel management, cleaner fuels and the use of routing software.

Further details from the Environment and Energy Helpline, tel: 0800 585794

Britain has a thousand LPG filling stations

Britain's 1,000th liquefied petroleum gas (LPG) refuelling station, at Charlton, south east London, was opened by Energy Minister Brian Wilson and Transport Minister David Jamieson in February. The number of LPG stations has now quadrupled since 1996.

Wilson used the occasion to announce a new £1 million 'LPG Boost' programme designed to increase the uptake of LPG vehicles by:

- introducing grants for garages to become PowerShift approved converters;
- promoting the benefits to rural communities where reliance on fuel is greater, particularly rural mid-Wales, East Anglia and the Highlands and Islands of Scotland; and
- working with manufacturers to put more production line LPG vehicles in show rooms.

LPG has significant environmental advantages over petrol and diesel and, thanks to a low level of fuel duty is nearly half the price. A typical motorist can save more than £400 a year by converting to LPG, says the DTI.

A list of LPG fuelling station addresses is available on the TransportAction PowerShift website at: www.transportaction.co.uk

Canal transport in a renewable era

by Eurlng Ian M. Arbon FInstE, Senior Partner, Engineered Solutions

Canals used to be for freight transport and are busy places again, albeit largely with heavily-polluting diesel engined craft. This article - the second of two based on papers given to a conference on 'transport in a renewable era' organised by the Institution of Mechanical Engineers and co-sponsored by the Institute of Energy - describes the conceptual design and development of what is believed to be the first renewably-powered canal narrowboat in the country.

The inland waterways of Britain have, in the past, been a source of much commercial activity. This activity declined in the 19th century with the advent of the railway, and in the 20th century the proliferation of the internal combustion engine made it seem even more unlikely that canals and rivers would ever again be taken seriously as a form of transport.

However, after WWII, interest in inland waterways began to revive as pleasure boating became more popular. Public fascination with the old canal system resulted in many canals being restored and river navigations improved. Boat hire companies multiplied and today business on the waterways is booming. There is also evidence, particularly on the broad canals, of a significant increase in freight traffic.

But the craft plying our waterways today is different from those for which the canals were built. Literal horse power has been replaced by the internal combustion engine, usually diesel, and while this enables faster and more convenient movement, it does nothing positive for the quality of the air, the water, the vegetation and the wildlife of the inland waterways.

Dirty fumes from badly-maintained engines pollute the air (there is no 'MOT' test for marine engines to control emissions); detergent-laden water from on-board sinks, showers and even washing machines, pours into the canals; wash from boats with inefficiently-designed hulls, driven too fast, erode the banks; and all of these intrusions upon the natural ecological balance of the countryside affect the habitat and life-cycle of the birds and animals that live on and by the waterways.

There is a unique opportunity here to build state-of-the-art inland waterways craft which will demonstrate significant progress both technically and environmentally.

Although the technology being developed will first be fitted on a leisure sector canal boat, where there is an obvious market potential, there are other very important spin-offs in the field of broad-beam canal and river leisure craft. A significant market is envisaged for similar drive systems for industrial and workboats, particularly for transporting fuels for renewable energy and energy-from-waste power plants.

A RENEWABLY-POWERED NARROWBOAT

After years of observation, particularly of the canal system, the partners of Engineered Solutions consider they have found at least a partial solution to the pollution problems mentioned above. Their intention is to build and commission a narrowboat that will run quietly, economically and efficiently, and with minimum harm to the environment, using the best of traditional and contemporary technologies, and still be commercially viable. The prototype boat has an overall length of 17.7 m (58 feet) and is expected to weigh about 17 tonnes when complete; it will be big enough for a potential 'live aboard' and be capable of travelling the entire British inland waterways system.

Before considering the specific technologies which have to be developed in the prototype boat, it is worth saying something about energy efficiency. The vast majority of canal boats built nowadays give no thought to energy-efficient design. Although obvious energy savings can be achieved by electric propulsion, mainly due to the significantly better speed-torque characteristics of electric motors compared with diesel engines, there is no evidence of a follow-through to improved hull design to actually reduce the power requirement. For example, our feasibility study showed that all known electrically-driven boats in the UK had been based on traditional hulls without any energy-efficiency devices. A few years ago, British Waterways designed a new hull, with a bulbous bow and S-shaped swim, called the 'Eco-hull', which significantly reduces both wash creation and power requirement for a given hull size. The prototype narrowboat has been based on a shell, built by Alvechurch Boats, which incorporates the Eco-hull design.

When considering an electric propulsion system, it is critical to establish the correct motor rating (a boat of this size would normally require a 25 kW diesel engine). Given the energy savings achieved by the choice of electric propulsion and the Eco-hull, it is calculated that the permanent magnet electric motor at the heart of the system will probably be rated at 8-10 kW. Even a brief study of the properties of electric power will reveal very real advantages of this form of propulsion; lack of noise, lack of fumes, greater manoeuvrability, acceleration and deceleration, plus the potential of harnessing the vast range of 'fly-by-wire' control options available today in marine power.

The large battery bank necessary to this form of propulsion also opens up the opportunity for greater use of electricity for 'domestic' use. All cooking and heating on-board will be either electric or fuelled by a solid-fuel stove with back boiler, thus obviating the need for any pressurised bottled gas (always a potential hazard) on-board. The locker space in the bows, normally reserved for large gas bottles, will thus be freed-up and can be utilised for storing fuel for the stove. Low-energy lighting is used throughout the boat and all electrical appliances are selected on the basis of the energy consumption ratings. This thinking should also ensure that the charge of the battery banks is retained as long as possible.

A further environmental consideration

is the disposal of 'grey water' from sinks, shower, washing machine, etc. At present, the inland waterways' legislation does not require 'grey water' to be retained in holding tanks but permits it to be drained into the canal. Anticipating that European directives will soon change this requirement, we have incorporated two 'grey water' holding tanks in the prototype design as the environmentally-friendly solution to this problem.

Shell of the proposed renewably-powered narrowboat

Use of renewable energy sources

The problem of re-charging the batteries on an electric boat has always been cited as an insuperable difficulty; very few waterways provide charging points. We believe we can successfully obtain sufficient clean, renewable power from:

- Solar: a number of solar photovoltaic (PV) panels will be permanently fitted to the roof of the boat. These will be flexible panels, capable of being walked on safely, essential on a narrow boat.
- Wind: two wind turbines will be mounted on the fore and aft decks of the boat; these will be mounted on retractable poles to allow passage under low narrow canal bridges and will normally be raised only when the boat is moored.
- Bio-diesel: a backup, water-cooled, generator onboard will be adapted to run on bio-diesel, which is a renewable diesel fuel substitute that can be made by chemically combining any natural oil or fat with an alcohol such as methanol or ethanol. Most European biodiesel is made from rapeseed oil combined with methanol which has itself been produced from energy crops, making this a truly renewable fuel. The cooling water from the engine/generator will be used to heat the domestic hot water requirements through a calorifier system.
- Biomass (wood): a solid fuel stove will be installed in the saloon, equipped with a back boiler to provide heating and hot water; this will burn timber from renewable sources (fallen timber is plentiful, and currently left to rot, along canal banks).

Contact Ian Arbon, FInstE on tel: 01780 754327, or e-mail: ian.arbon@ukgateway.net

Energy innovations

Selection of the main propulsion drive

The likelihood is that this will be permanent magnet DC motor as this provides the optimum speed - torque characteristic for a canal boat. Although there are three manufacturers of such motors known to us, none of them has experience of powering a boat of this size and weight.

The rating of the main drive motor

Although the steady state power rating of the motor is very small, less than 1 kW, a narrow boat motor must have significant excess capacity for starting and, more importantly, for stopping the boat (it is the only brake!). It is estimated that the motor rating will need to be between 6 and 10 kW but this will have to be demonstrated by field trials.

Speed of the main drive motor

For the likely rating of the permanent magnet motor, the speed has to be in the order of 4000 rev/min. The optimum propeller speed, on the other hand, is between 700 and 900 rev/min. We want to avoid the weight, cost and high maintenance of a gearbox and will have to investigate other forms of speed reduction.

Sizing the battery bank

This is a complete unknown, given that this arrangement has not been built before. We will probably have to significantly oversize the battery bank and find out from field testing what a more appropriate size would be for production models.

Sizing of the biodiesel generator set

Because of the unknown performance of a combination of wind and solar energy for battery charging on a canal boat, it is virtually impossible to work out the optimum generator rating other than by field trials. For this reason we would have to install an oversized generating set.

Use of biodiesel

Although we would intend to use a standard marine diesel generating set, none of the large manufacturers we have spoken to has any experience to date with the use of biodiesel. This, again can be proved only by field testing.

Power-assisted steering

Although the boat will normally be steered using a conventional tiller, we are also proposing a servo-assisted remote steering capability. Both the motor for the power-assisted steering and motor for the bow thruster will need to be co-ordinated through the control system.

Events

April

Global windpower
Conference & exhibition
2-5 April, France
Contact: European Wind Energy Association
Tel: +32 2 546 1940
Email: info@ewea.org

Hydrogen investment forum
Conference, 3-4 April
Washington DC
Contact Intertech Conferences
Tel: +1 207 781 9800
Email: info@intertechusa.com

Enterprise-wide risk management
Conference, 4-5 April, London
Contact: Energyforum.net
Tel: +46 8 459 9620
Email: info@energyforum.net
Co-sponsored by the Institute of Energy

Sustainable development research
Conference, 8-9 April
Manchester
Contact: ERP Environment
Tel: 01274 530408
Email: elaine@erpenv.demon.co.uk

CHP in industry and commerce
Course, 9-10 April, Leeds
University of Leeds,
Alison Whiteley
Tel: 0113 233 2494
Email: cpd.speme@leeds.ac.uk

Coal UK 2002
Conference, 10 April, London
Contact: McCloskey Group
Tel: 01730 265095
Email: amber.bates@mccloskeycoal.com

InstE Branch Event
Ellis memorial lecture
Lecture, 10 April, Birmingham
Contact: Midlands Branch - Vian Davys
Tel: 01332 666296
Email: vian.davys@eme.co.uk

Energy policy review - the outcome?
Workshop, 11 April, venue TBC
Contact: Di Hammet
Tel/Fax: 020 8767 9744
Email: BEAwec@aol.com

Diesel particulates and NOx emissions
Course, 15-19 April, Leeds
University of Leeds,
Alison Whiteley
Tel: 0113 233 2494
Email: cpd.speme@leeds.ac.uk

InstE Branch Event
Greenhouse gas mitigation technology
Seminar, 16 April
Loughborough
Contact: Midlands Branch - Vian Davys
Tel: 01332 666296
Email: vian.davys@eme.co.uk

The new European gas business: can it meet the security challenge?
Seminar, 16 April, London
Email: alison@igem,org.uk

Beyond petroleum
Seminar, 16 April, venue TBC
Contact: Chris Maude
Tel: 01622 858762

Adaptive computing in design and manufacture
Conference, 16-18 April, Exeter
www.adcomtech.co.uk/ACDM2002
Co-sponsored by the Institute of Energy

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

UK offshore wind
Conference, 17-18 April
London
www.offshorewindfarms.co.uk

InstE Branch Event
Climate change levy
Discussion, 18 April, Epsom
Contact: London and Home Counties Branch - Joanne Wade
Tel: 020 7359 8000
Email: joanne@ukace.org

InstE Branch Event
Visit to Magna
Visit, 20 April
Contact: Yorkshire Branch - Andrew Mallalieu
Tel: 0113 276 8888
Email: info@facultatieve-technologies.co.uk

Renewable Energy Summit
Conference, 23-24 April
London
Contact: Global Business Network
Tel: 020 7291 1030
Email: info@gbnuk.com

Profiting in the green economy
Conference, 24 April, London
Contact: Environmental Industries Commission
Tel: 020 7935 1675
Fax: 020 7486 3455

IEMA annual conference
Conference, 24-25, April
Doncaster
Contact: IEMA
Tel: 01522 540 069
Email: a.underwood@iema.net

Carbon capture, storage and sequestration
Conference, 29 April - 2 May
IBC Conferences
Tel: 0207 017 4052
www.ibcenergy.com

May

UK electricity markets
Workshop, 7-9 May, Brighton
Contact Power Ink
Tel: 01273 202920
Email: margaret@power-ink.com

InstE Branch Event
Yorkshire Branch AGM & Dinner
10 May, venue TBC
Details from the Yorkshire Branch - Andrew Mallalieu
Tel: 0113 276 8888
Email: info@facultatieve-technologies.co.uk

InstE Branch Event
Branch AGM
Date and Venue TBA
Details from the South Wales & West of England Branch - Tony Boulton
Tel: 0117 9323322
Email: a.boulton@talk21.com

National engineering recruitment
Exhibition, 10-11 May, London
Tel: 0870 870 7411
www.engineerjobs.co.uk

Insurance - implications for the oil and gas industry
Conference, 13-16 May,
London
Contact: Global Business Network
Tel: 01553 770202
Email: gerber@gbnuk.com

Gas industry awards luncheon
Lunch, 14 May, London
Contact: SBGI
Tel: 01926 462916
Email: events@sbgi.org.uk

InstE Branch Event
Afternoon tour of Oldbury Power Station
Visit 16 May
Details from the South Wales & West of England Branch - Tony Boulton
Tel: 0117 9323322
Email: a.boulton@talk21.com

Coal - eight years on
The Energy Industries Club
21 May, venue TBC
Details from Chris Maude
Tel: 01622 858762

ET2002
Conference & Exhibition
21-23 May, Birmingham
Tel: 0870 429 4384
Email: exhibit@fav-house.com
Co-sponsored by the Institute of Energy

InstE Branch Event
Branch AGM
AGM, 22 May, Winchester
Contact: South Coast Branch, Chris Wilson
Tel: 01252 673570

Improving electricity efficiency in commerical buildings
Conference 27-29 May
France
Email:
infos@ieecbr15@online.fr

Annual HECA conference
Conference, 27-28 May
Birmingham
Contact: Institute of Energy
Tel: 020 7580 0008
Email:
events@instenergy.org.uk

Environmental protection: public perception and the consultative process
Seminar, 27-28 May, venue TBC
Contact: David Jacobi
Tel: 01707 632574
Email:
david.jacobi@environment-agency.gov.uk

Energy & power risk management
Conference, 28-29 May
Amsterdam
Tel: 020 7484 9898
Email: conf@riskwaters.com

The future of european utilities
Conference, 28-29 May,
Brussels
Tel: 020 7608 0541
Email: admin@confs.co.uk

All energy opportunities 2002
Exhibition, 28-29 May,
Aberdeen
tel: 0208 241 1912
Email: judithpatten@msn.com

How to purchase gas and electricity
Course, 30 May, Bradford
Contact: Energy Information Centre
Tel: 01638 751400
Email: info@eic.co.uk
Co-sponsored by the Institute of Energy

Alternative fuels for road transport

If you benefited from reading the energy in transport features and need to develop your skills, we are taking registrations of interest for a one day Alternative Fuels for Road Transport awareness training course.

This course aims to review, compare and demystify the alternative road vehicle fuels in terms of their environmental credentials, their availability and the maturity of the vehicle technologies needed to use them.

If you are interested in attending this course to gain a broad overview of the topic please contact Katie Moore on 020 7580 0008 or e-mail events@instenergy.org.uk

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

Your views on the Energy Review

Towards the end of February many of us were greeted with the arrival of the much-talked about Energy Review Report, published by the Government's Performance and Innovation Unit. A weighty publication that the PIU team should be congratulated on producing within what was a very tight timetable for consultation and reporting. As members will be aware, in addition to the InstE's formal submission to the Review, we organised the largest Review stakeholder event with the PIU team last October. We have also expressed our support to continuing debate among energy professionals on some significant issues raised by the report's findings.

However, we are interested to hear your views - which issues do you want to see the InstE raising and with what priority? The InstE website has a forum page, for you to express your views simply and quickly to enable your participation in the debate. A number of events are being organised as we have advised members via email and *Energy World*.

To register your interest in future energy policy events contact Katie Moore on events@instenergy.org.uk

You and your president

It was with a sense of pride and privilege that I commenced my Presidential year at last year's AGM and as I near the end of probably the shortest 12 months of my life, I thought it worthwhile to share with you my views on the Presidential succession. As I took office I drew the analogy of my being a relay runner taking on the baton for my lap in a very long race, building on what all my distinguished predecessors had achieved to ensure that the Institute of Energy remains strong and well positioned for the laps ahead. Well, so far so good, I still have the baton and I look forward to a clean handover to my successor John Blackhall on the InstE's Birthday on 5th July in the knowledge that we remain well placed to make the progress we deserve. To take the InstE forward with our reputation and status enhanced within the energy and engineering professions, being meaningful to the membership we serve and meeting our obligations to society at large.

In this, the InstE's 75th year we are undoubtedly the stronger for the contributions made by all our Presidents who have worked tirelessly, and voluntarily serving our Institute and its members with distinction. There is much to celebrate and promote about the good work that has been achieved, often in difficult and changing times. The Institute of Energy now epitomises the modern professional body without eschewing the original principles on which it was founded. As a Royal Charter professional body and learned society the InstE offers value and recognition to its members, developing and delivering new services in education, training and qualification standards to support continuing professional development at every career level. Through this we are collectively better placed to serve society and also to fulfill our responsibilities as a registered charity to support those in the energy community yet to benefit from membership. Over the years, your Presidents have served as ambassadors of these objectives, each bringing to the post different and distinctive skills and knowledge from a multitude of energy related backgrounds, but above all a commitment to serve the InstE and its membership.

Some Presidents have been long serving members who have been involved with the InstE from their early career development, others come offering valuable contributions from a wide range of energy disciplines, both engineering and non-engineering, some as captains of industry.

It is the responsibility of The InstE's Council to elect the President and it does so against a wide range of criteria by which the suitability of any nominee may be assessed. These include:-

- collective representation balanced across the different sectors of energy interests,
- time to commit to the InstE and its objectives,
- time and ability to represent the InstE as an ambassador during office, and
- high profile individuals within one or more of the different sectors.

In considering suitable candidates for the Presidency, Council continues to seek a balanced representation from

all sectors of the energy industries and welcomes nominations from the membership at large. In the spirit of engaging membership beyond Council, your views and your input are important and Council will continue to encourage your positive involvement in supporting the governance of your Institute.

In the July issue, *Energy World* will look back at Presidents of the past as a reminder of the diversity and relevance each has brought to the Institute of Energy during their term of office.

It is your Institute and your President and it has been my privilege to have been part of the Presidential chain which has and will continue to serve you with distinction.

John Ingham, FInstE
President Institute of Energy
March 2002

What price carbon?

The answer to the question was admirably provided by Dr Bill Kyte at the 29th Idris Jones Memorial Lecture, held at the prestigious Cardiff Castle and hosted by the South Wales and West of England Branch of the Institute of Energy.

The annual lecture, organised every February by the branch was generously supported this year by BP Energy and its Managing Director, Phil Piddington. Dr Kyte, Head of the Sustainable Development Department at Powergen UK plc engaged a full audience of energy professionals to review the current economic tools being deployed to combat climate change.

Following the lecture 120 members and guests of the branch sat down to discuss the lecture over lunch. A series of brief, light-hearted speeches, together with thanks to all involved drew the event to a close. However, this was not without reference to plans already being formulated for next year's lecture. The Idris Jones Lecture is always oversubscribed which brings disappointment for some, so be prepared to book early next year if you would like to attend.

Copies of Dr Kyte's presentation will be available on the InstE's website so for more information visit www.instenergy.org.uk

Annual general meeting

Notice is hereby given that the seventy-fifth Annual General Meeting of The Institute of Energy will be held at the Institute of Energy at 12.45pm on Friday 5 July 2002, to transact the following business:

1. To sign the minutes of the 74th AGM, held on 28 June 2001.
2. To receive the Annual Report and Accounts of the InstE for the year ended 31 December 2001, together with the report of the auditors.
3. To receive the Annual Report and Accounts of the Benevolent Fund of the InstE for the year ended 31 December 2001, together with the report of the auditors.
4. To re-elect Kernon & Co., Chartered Accountants, to serve as auditors for the ensuing year and to agree that their remuneration be agreed by the Executive Committee.
5. To approve the level of annual subscriptions payable by individual grades of membership for 2003.
6. To announce the names of new members of Council.
7. Any other business (Council require 21 days notice in writing).

Dated this 19th day of March 2002.
By order of the Council.

Mrs L A Kingham MInstE
Secretary & Chief Executive

Don't miss out, register for TEMOL before 1st May 2002 and get energy management training at 2001 prices

Designed for practising professionals Training in Energy Management through Open Learning (TEMOL) has never been more relevant as a result of the Government's Climate Change Programme and particularly the Climate Change Levy.

If you need a recognised qualification in energy management and would like a flexible course that allows you to study at your own time, in your own home, then call for more information today.

The Institute of Energy TEMOL course has been fixed in price since the mid 1990's, however, as a result of rising costs, the price of the course will be going up from the 1st of May 2002.

If you want to develop your skills as a professional energy manager, register for TEMOL by 30th April 2002 and you can get the course at the 2001 price of just £1250 (VAT not applicable) including all materials, tutor and project support.

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THROUGH OPEN LEARNING

Can you really afford not to take up this offer? One TEMOL graduate made energy savings of £6,500 a year as a result of completing the course. Having worked through the TEMOL course the candidate was able to recommend a wide range of improvements with fully worked technical solutions, costing and financial analysis.

TEMOL is mapped to the National Standards for Managing Energy and has a practical and employment focus covering both technical and managerial aspects of energy management. If you have been thinking of developing your energy management skills in 2002, act now and register for TEMOL at 2001 prices.

To find out further information, including the study of individual TEMOL elements and to register and take advantage of the 2001 price offer please call Vicky Ratcliffe, Education Officer at the Institute of Energy on 020 7580 7124 or e-mail education@instenergy.org.uk

HECA 2002

Following the successful launch of the HECA Officer Awards at last year's HECA Conference, the Institute of Energy has been working with the UK HECA Fora Group to prepare the ground for the 2002 Awards. The Awards are an important development in building the profile of the HECA Officers Network, recognising the commitment and innovation that officers have shown in overcoming challenges to make significant achievements in home energy conservation.

The HECA Officers network is arranged across the UK and is divided into twelve regional and country groupings. HECA teams or individual HECA Officers from each grouping are eligible to enter for each of the 12 Awards. One of the developments to this year's Awards is that the Chair's from each grouping will be short-listing up to three nominations to forward to the InstE judging Panel. The Awards will be presented at the National HECA Forum conference, which is taking place this year on 27 and 28 May 2002 in Birmingham.

These Awards provide an excellent opportunity for you to be recognised for your achievements and the entry process is simple and quick to complete.

To obtain an entry form or seek further information about the Awards, please contact Anisha Patel at the UK HECA Fora Secretariat, 2-4 Market Place South, Leicester LE1 5HB or e-mail patea901@leicester.gov.uk

NEW MEMBERS

NORTH EASTERN

Mr P Greco, Student
University of Newcastle
Ms C Jordan, Student
University of Newcastle

SOUTH WALES AND WEST

Mr K Agnew Affiliate
Solutia UK Ltd
Total Energy Gas Supplies Ltd
Group Member

SOUTH COAST

The Council for Registered Gas Installers (CORGI)
Group Member

LONDON & HOME COUNTIES

Mr S Garrett MInstE
Slough Heat and Power
Dr A White FInstE
Schroder Salomon Smith Barney
Mr Niall Bickerton MInstE
BG Group
Mr Philip Evans MInstE
Johnson Controls
Mr S Hough MInstE
Mapeley Limited
Mr J Hoare MInstE
Solar Century
Ms M McGrath, Graduate
Omega Partners

YORKSHIRE

Mr R Donovan MInstE
United Utilities Green Energy Ltd
Dr J Jones MInstE
University of Leeds
Sheffield University:
Mr. Tulio Cintra - Graduate
Mr N Al-Qassabi - Student
Mr R Haas - Student
Mr S Koromantzos - Student
Miss B V Lu - Student
Miss O Mitaftsi - Student
Miss T Ortega - Student
Mr D W Shang - Student
Miss B Zhang - Student

NORTH WESTERN

Mr A Small, Student
University of Central Lancashire
Mr J Brougham, Student
University of Central Lancashire

Deceased Members
Mr Arthur Hallam MInstE
Mr Victor Miller MInstE
Mr Eric Field MInstE
Mr Gwilyn Bolan FInstE
Mr John Clarke MInstE

SITUATIONS VACANT / WANTED

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[if interviews unsuccessful].
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Good Technical, Commercial, Interpersonal and Presentation Skills.
UK travel from a southern base.
Further details from Steve Howe.
Email: line7@energy121.com

Sales Manager Required
Up to circa £40 k package.
Self Motivated. Commercially and Technically [Energy Plant] capable.
Willing to travel overseas as required.
Languages of interest.
Central England base preferred.
M/S Word attached CV Steve Howe.
Email: line9@energy121.com

Energy Practitioner Required
Suit Freelance or Small Ltd., to conduct extensive work.
Up to £30 k p.a. rate if site based, [less if home office based].
M/S Word attached Practice Profile and availability to Steve Howe.
Email: line6@energy121.com

Job seeker

I am a recent graduate currentally seeking employment. I am a member of the Institute of Energy, based in Glasgow at the moment and would prefer to stay in Scotland.
I graduated in November 2001 from Strathclyde University with a MSc in Energy Systems and the Environment. Having previously graduated from Napier University, July 2000, with BEng(Hons) in Energy and Environmental Engineering. I also completed a six month placement at my time at Napier. If any other information is required please to not hesitate to contact me.

Mark
e-mail: mark_hobbins@yahoo.com

This space is available for members to advertise. For more details e-mail: eworld@instenergy.org.uk

The Environmentalist

The Environmentalist is the magazine of the Institute of Environmental Management and Assessment (IEMA). The magazine is published bi-monthly. An annual subscription is being offered to members of the InstE at a preferential rate of £25. To obtain a sample copy or subscribe at the preferential rate please contact Amy Underwood quoting 'Institute of Energy Offer' on 01522 540069 or e-mail: a.underwood@iema.net

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London, 22nd April 2002

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Midlands Branch

The 14th Annual Ellis Memorial Lecture and Lunch

Will be held on the 10th of April, commencing with coffee at 10.15 at the Birmingham Botanical Gardens, Westbourne Road, Edgebaston.

Lecture given by Andrew Warren, Director, Association for the Conservation of Energy On the latest EU Building Regulations that come into effect later this year. Followed by a buffet lunch with wine and plenty of opportunity for networking

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