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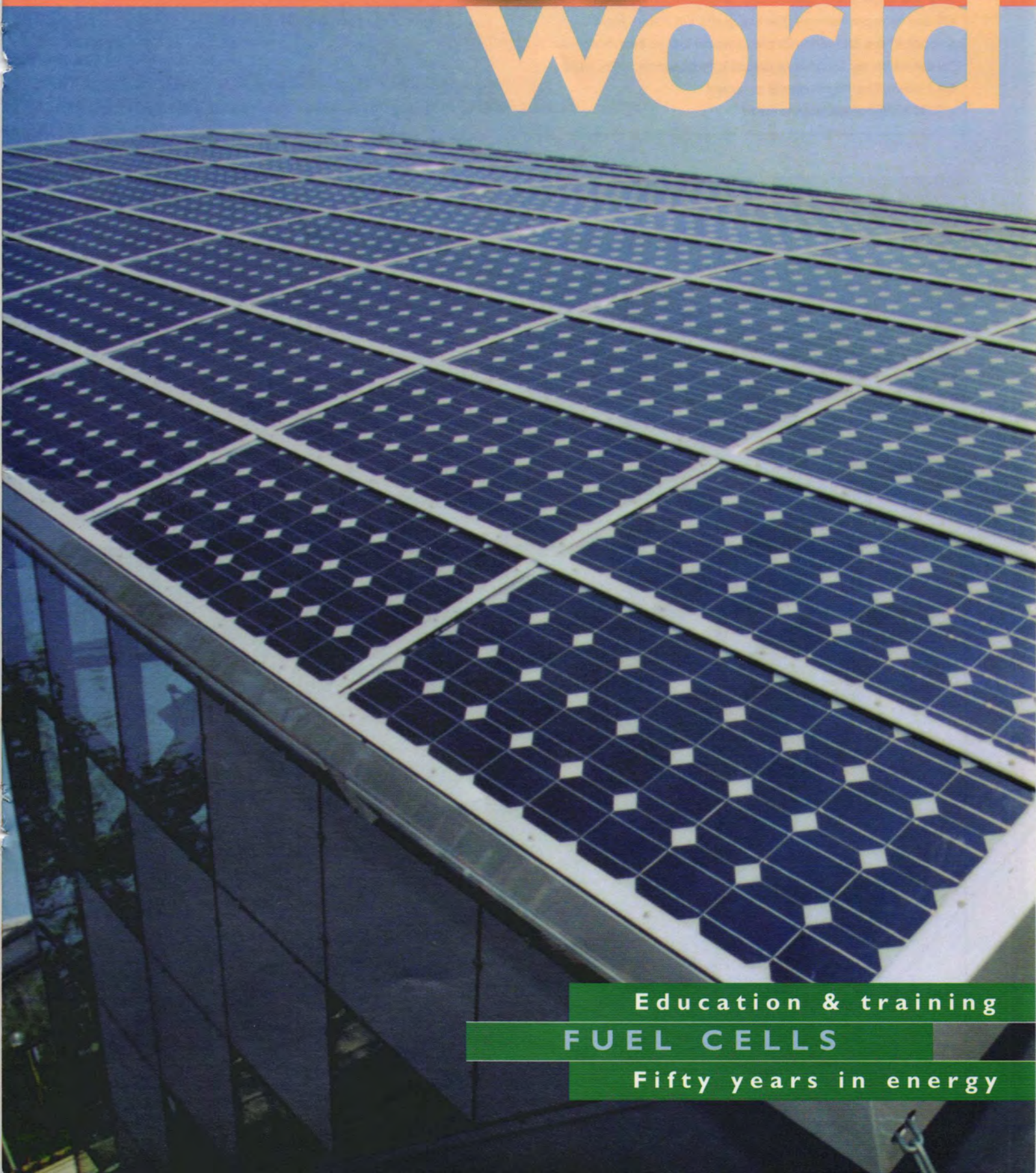


Education & training

FUEL CELLS

Fifty years in energy

Did you do your professional training in the Netherlands?

Stephanie Juranek would like to know about the role of professional organisations in the improvement of diploma recognition in the Netherlands and the UK.

As a student in Educational Sciences at Leiden University I am conducting my thesis on the above topic.

Ideal interview candidates will be Dutch professionals who are working in the UK and have had training in the Netherlands. So if you know about the process of diploma recognition in the UK and how professional practice in the UK differs from the practice in the Netherlands, then I would like to hear from you.

Please write to: Stephanie Juranek, Pelikaanhof 19b, 2312 EA Leiden, The Netherlands or email st9330372@rulfsw.leidenuniv.nl

Prospects for Solar PV

If you can answer the central question of the prospects for Solar PV within the product portfolio of a large multinational oil company, then I would like to talk to you. As an MSc student at Imperial College London, I am writing a thesis on the above and would be grateful of any opinion and contribution.

I will be examining the previous barriers to successful entry into this market including the economic reasons, as well as focussing on what future market scenarios will be needed to assure the success of this form of energy production.

Any comments or suggestions would be gratefully received judith.hassall@ic.ac.uk or tel: 0171 354 8309

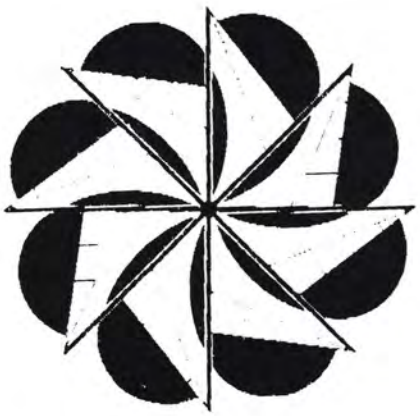
Energy: Solving the policy jigsaw

You will recall seeing a notice for the Institute's energy policy event, due to be held on the 22nd September 1998.

To ensure that you reap the maximum benefit from attending a timely and topical conference, we have rescheduled it for later on in the year.

Please be patient while we make sure this conference happens at just the right time!

So watch this space!



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1998
WORLD RENEWABLE ENERGY CONGRESS

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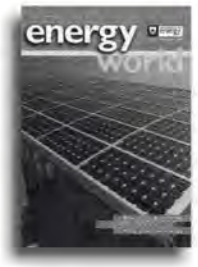

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COVER

The futuristic building is BP's Solar Showcase - a temporary structure built to demonstrate the company's photovoltaic technology to world leaders gathering in Birmingham for the G8 Summit in May. The 176 solar panels generate enough power to meet the electricity needs of four energy-efficient homes, says BP.
The 12 m by 8.5 m building is connected to the grid to allow electricity exports by day and import at night. A 15kW solar system powers the building's lights, appliances and electronic equipment, including computers, television, fax machines, a sound system and low energy lights.

Waste-to-energy - should we put more energy into waste disposal?

Waste is a nuisance which creates a daily liability for its disposal. We create too much of it and then try to find ways of supporting its disposal by linkage with other 'benefits'.

There is nothing inherently wrong in turning a liability into an asset such as is done when converting waste into energy but in the UK we have almost seen the tail wagging the dog when in pursuit of some waste-to-energy schemes.

The tail-wagging has come from high prices granted by the Non-Fossil Purchasing Agency to encourage the conversion of waste disposal into electricity generation. Whilst there have been some excellent projects, many more have failed to proceed.

Adrian Crank, Manager of Strategic Development, NNC Ltd

Failure to proceed has been in part due to the inability of some schemes to find financial closure because the technology proposed has no track record in electricity production and is therefore perceived to be a risk which cannot easily be covered. Insurance-based products are available which will cover the project against failure to perform but these can add a further burden to the project finance requirements.

Let us not forget that NFFO was introduced to encourage and kick-start the use of alternative, renewable fuels to provide energy. However, rewards were only available to those who were able to match fairly well-proven disposal technology to an electricity generation project. All of this electricity tail-wagging has lost sight of the waste producer's need for an environmentally benign and cost-effective means of waste *disposal.*

So, put to one side for a moment those opportunities to create more electricity and consider the various ways in which domestic and other clean waste can be disposed of in a more beneficial way than today's hole in the ground or incineration.

For biomass, the UK lacks alternatives to incineration but has made some strides forward in digestion techniques and small steps in gasification. The nature of and the scale of arisings limit the size of installation but there could be opportunities available with fuel-mixing.

An important consideration is that some biomass projects are inhibited from making progress because of the constraints posed by linking them to electricity production.

An example is illustrated by a UK manufacturer of furniture whose imports of wood are fashioned into a great quantity of kitchen and bedroom units. The amount of woodwaste and offcuts runs into a thousand tonnes per week. A developer approached the furniture manufacturer and offered to construct a woodwaste-fired power station on his site which would give access to cheap electricity and heat and still provide a substantial surplus of electricity for sale into the grid.

Whilst the concept of cheap energy was attractive to the site owner, the process of modifying his site to accommodate the scheme, carrying out an environmental impact assessment, applying for planning permission, convincing the local school that noise and emissions would not be obtrusive, raising capital to initiate the scheme all came to nought when he realised that his only concern was that he had a waste-disposal responsibility.

The problem here was that the waste owner was not interested in translating his waste disposal problem into a power station, he just wanted to reduce his disposal costs. If a developer would care to take his waste away he would be very happy.

But consider how the opportunity might have developed if there had been a renewable technology park in the region which encouraged the development of home-grown and imported technologies and enabled the receipt of waste materials to feed those developments.

Consider also making that technology park the centre for a high-temperature gasification plant which would take receipt of domestic/municipal waste and produce little or no ash together with usable synthesis gas, mineral aggregates, recyclable metal granulate and some elemental materials.

The plant could be modularised to serve small and large communities, be built upon nominated land (brownfield site reclamation?), and serve as an infrastructure for new/developing renewable energy schemes. Certainly, if the transport system for delivery of waste/fuel was in place and there were facilities in place for a grid connection it would make the siting, funding and operation of new technology schemes a lot easier.

Pie in the sky? Perhaps not. Consider also that all the waste currently tipped into landfill sites could be exhumed and fed into a gasifier - true recycling. Maybe gasifiers could be located adjacent to existing landfill sites?

Political will at both local and central level could achieve this, but the driver for such a vision would have to be the need for clean waste disposal, not electricity production.

So perhaps NFFO could be restructured to promote investment in technology development so that a good foundation for a waste-to-energy/waste disposal plan can, in accordance with the Agenda 21 commitment, be adopted. This would steer us away from an artificial cost-benefit electricity production programme and back towards the fossil fuel replacement/support initiative.

These are the personal views of Adrian Crank and do not necessarily represent those of NNC Ltd

Auckland power failure inquiry searches for causes

The New Zealand Ministry of Energy has appointed the Capenhurst-based international energy consultancy EA Technology to help investigate the catastrophic power failure which blacked out Auckland's central business district for more than four weeks in February.

During the breakdown, which affected New Zealand's largest city and commercial hub, hundreds of businesses were shut down. Residents were evacuated and hospitals operated on emergency generators. The disaster is expected to reduce New Zealand's 1998 gross national product by up to 0.35%.

The government's Ministry of Energy has set up the inquiry to establish the technical cause of the power failure and whether the local utility company, Mercury Energy Limited, had carried out adequate distribution network planning and risk evaluation. The inquiry has appointed Australian energy company Integral Energy to prepare reports into both the technical failure and the operational circumstances in which it occurred. EA Technology has been appointed to carry out an independent peer review of Integral Energy's work.

The sequence of the Auckland breakdown is well known. The business district is served by four 110 kV underground cables: two oil-filled, two gas filled. One of the oil-filled cables failed, causing an overload in which the second oil-filled failed: the two remaining cables then broke down. The cables took a week to repair and then failed a second time, leaving the district with greatly reduced power for more than a month.

One theory being examined is that record hot weather and unusually dry ground conditions contributed to the initial failure. The reports will also seek answers as to why this produced subsequent failures and the reasons for the delays in restoring full power.

Lighthouses and beacons along the Barents Sea coast in Russia's Kola Peninsula are being updated to operate on solar power stored in Saft Sunica photovoltaic batteries. The lighthouses range from small lights with a peak power of just 60 W to major lights with a total installed power of 4.4 kW. Saft supplies a range of nickel-cadmium batteries with capacities from 100 Ah to 7,000 Ah. Technical challenges include the fact that, above the Arctic Circle, batteries must be capable of providing power without recharge during three months of darkness in winter.

Cutting Caribbean power surges

Coventry-based telemetry systems specialist, Serck Controls, has won a contract to supply a SCADA power management system to Grand Cayman Island in the Caribbean.

The project involves the installation of power management software which will automate generator control to match output with demand, as well as carrying out risk assessment to minimise the effects of power surges, the sudden loss of generation and fault tripping of main feeders.

Risk of major disruptions to supply, arising from conditions causing instability of the power network, will be reduced by Serck's system enacting critical load shedding. This, says Serck, will create a more reliable and consistent public power supply network and enable the Caribbean Utilities company to provide a better service to customers.

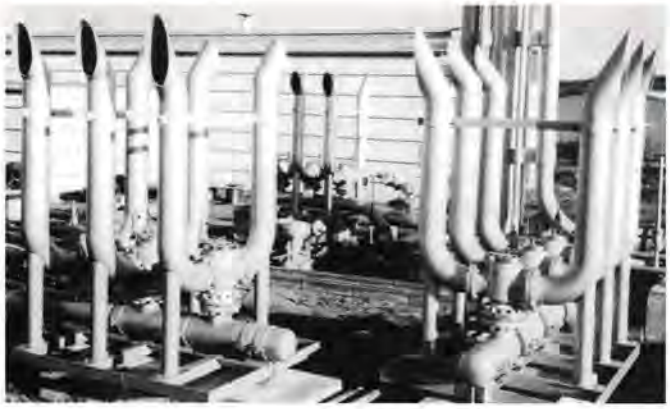
The initial phase of the project involved extensive field studies to investigate the precise nature of the island's power supply so that the system could be configured accordingly.

Eastern buys into Norwegian hydro power

The UK's Eastern Group has increased its interest in the Scandinavian electricity market with an agreement to control power off-take from two hydro-electric power stations in Norway.

The company, through its subsidiary Eastern Power and Energy Trading Limited, has negotiated the rights to 187 MW of the power output of plants at Svartisen and Kobbelv. Swedish energy company Lunds Energi will take the remainder. The 55-year lease gives Eastern the rights over water held behind the dams, the right to time the operation of the power stations and to sell the electricity generated.

The stations together have a total capacity of 650 MW. They will continue to be owned and maintained by Statkraft, the Norwegian state-owned generator. In November 1997, Eastern became the first British company to buy and sell electricity in the Scandinavian power market, known as the Nord Pool.



The world's first man-made underground storage unit for natural gas, in the Czech Republic, uses Series 400 pilot operated safety relief valves (POSRV) from the UK-based Anderson Greenwood. Transgas of Prague transfers gas from Russia to the Czech Republic, Germany and France. Contracted to purchase equal monthly quantities of gas from Russia, Transgas stores any excess accumulated during the summer months in the storage unit's granite tunnels, 960 m below ground in Pribam.

Unlike traditional gas storage units which have low transfer capacities, Transgas can pump up to six million cubic metres per day to match demand as required. POSRV are required to protect the gas pipeline which runs from the storage unit to the main transfer pipeline.

Costa Rican trees to soak up carbon offsets

The Costa Rican government and Societe Generale de Surveillance Holding SA (SGS) have announced the certification of a carbon offset program that will preserve over 1.25 million acres of Costa Rican forests. The agreement will also enable Costa Rica to earn hard currency through the worldwide sale of credits for greenhouse gas removed from the atmosphere.

The SGS certification, the first ever under terms of the Kyoto agreement on climate change, verifies that the planned set-aside of Costa Rican forests as a carbon sink will remove more than 1 million tonnes of carbon equivalent from the atmosphere.

Creating a market for carbon offsets provides developing countries with additional financial resources from their tropical forests - money that can be earned without cutting down their trees, says SGS (see also *Energy World* February 1998).

Sale of Certified Tradable Offsets (CTOs) could earn Costa Rica more than $20 million this year and $300 million over the project life. Offsets will be sold to companies in industrialised countries whose human-induced greenhouse gas emissions exceed targets established by the Kyoto summit in 1997.

'Now is not the time to close the nuclear option' - WEC

The Kyoto Protocol, if implemented, represents only a small step in the control of greenhouse gas emissions, and nuclear power should have a continuing part to play in long term sustainable energy development - if public concerns can be allayed. So says Michael Jefferson, Deputy Secretary General of the World Energy Council (WEC).

The Kyoto Protocol calls for reductions in six greenhouse gases between 1990 and 2008/2012 by the carbon dioxide equivalent of 5.2% in aggregate by the industrial countries and the economies in transition. Speaking at a meeting of the Japan Atomic Industrial Forum, Mr Jefferson said that even if the Protocol was successfully implemented, and emissions continued to fall after 2010 by a further 1% per annum, then the expected mean global temperature increase of just over 2°C by 2100 would only be reduced by some 15%.

Mr Jefferson said that the WEC sees a clear need for the expansion of non-fossil fuel supplies, including nuclear power. WEC scenarios show that if the development of nuclear power continues by the year 2050, it could account for as much as 31% of global electricity generating capacity.

But the sustainable development of nuclear power requires improved nuclear technology, the securing of high safety performance, good operating practices, the safe management of nuclear waste, and transparent relationships with the public, so that facts about nuclear power are understood by them and their confidence in it is re-built.

Mr Jefferson concluded: "This is not the point in human history when nuclear power should be consigned to the white elephant's graveyard. There are many hard choices lying ahead, and premature closure of the nuclear option is liable to make them much harder still".

Japan's largest wind power plant

Hisai city in central Japan is be the home of a four-turbine, 3 MW wind power plant to be opened at the end of the year. It has awarded a Y800 million contract to NKK for the construction of the plant. NKK will provide the Dutch-built turbines and will undertake the civil engineering and systems integration.

The use of wind energy has grown rapidly over the past few years in Japan. There is growing support from the Ministry of Trade and Industry and Japan's New Energy and Industrial Technology Development Organisation.

Brown Book suggests UK oil and gas production is peaking

The 25th edition of the Government's 'Brown Book', the record of the oil and gas industry's achievements for 1997, majors on the environmental.

Launching what is also Volume 2 of the Government's Annual Energy Report, Mr Battle said: "Tremendous exploration opportunities still remain in both the mature and the frontier areas of the UKCS. But the oil and gas industry faces some significant challenges. Perhaps the greatest, and one which is faced by Governments around the world, is reconciling our need to protect the environment while working with industry and encouraging it to succeed. The major task of minimising the impact of activities on the marine environment will challenge the commitment and ingenuity of all the companies involved."

"Developing petroleum resources on the UK Continental Shelf has been one of the great success stories of Britain's industry over the past thirty years" added Mr Battle: "and it has been documented for most of that period in the Brown Book which was first published as a report to Parliament in 1973, costing 20p and all of 13 pages long. The latest edition is 214 pages long."

The 1998 Brown Book says that:

- there are some 31,000 people employed offshore, while a total of 382,000 jobs depend directly or indirectly on the industry;
- since the start of major development in 1965 it is estimated that the industry has invested £73 billion - about £124 billion at 1997 prices;
- in the same period, the industry has contributed £86 billion to the Exchequer - the equivalent of £142 billion pounds at 1997 prices;
- there are now more offshore fields than ever before, with 22 fields coming on stream in 1997, making 186 in production;
- gas output has reached a record 91 billion cubic metres, up from 90 bcm in 1996, although oil production was slightly down from 130 million tonnes to 128 million tonnes; and
- expenditure on exploration and appraisal in 1997 is estimated at £1.2 billion, some nine per cent higher than 1996.

The Book also suggests, rather tentatively, that "possible maximum remaining reserves of oil are estimated at 2015 million tonnes and possible maximum remaining gas reserves are estimated at 1985 billion cubic metres".

Local MP Ann Coffey opening a second CHP unit at McVitie's UK manufacturing plant in Levenshulme, Manchester. The new unit will cut energy bills at the site by a further £220,000 a year, says the CHP Association, adding to some three-quarters of a million pounds saved since the first unit was installed in 1992. The new CHP unit supplies just over 1 MW of heat for use in both space heating and the manufacturing process, and generates 1 MW of electricity for use on-site.

Eastern moves into Irish wind scene

Eastern Group has taken its first steps into wind energy as part of a commitment to see renewable energy sources account for 10% of its generating capacity by 2010. The company is investing £800,000 in a project to erect a wind turbine, in County Antrim, Northern Ireland, to produce up to 1 MW of electricity.

The British designed turbine, to be supplied by Renewable Energy Systems and built by Peter Brotherhood Ltd, will measure 45 m from ground to hub with 52 m diameter rotor. It is expected to the operational by October this year on a site which already has planning permission. The electricity will be sold to Northern Ireland Electricity as part of the Non Fossil Fuel Obligation and connected to its 33,000 volt power network. The turbine will be operated on Eastern's behalf by B9 Energy (O&M) Limited.

- A new 15 MW wind farm, developed and owned by Renewable Energy Systems (RES) and B9 Energy Services has opened at Cark, Co Donegal. The farm, which comprises 25 Micon 600 kW turbines, will produce 14% of Donegal's total electricity demand annually. The project has been generating successfully since Christmas 1997.

Dulas keeps its 'green' base in rural Wales

Dulas Ltd's new building in Machynlleth, mid-Wales

One of the UK's leading renewable energy engineering companies, Dulas Ltd, has expanded to suitably green new premises at the Development Board for Rural Wales Dyfi EcoParc, built with financial support from Europe.

The highly acclaimed Unit 1 was presented with an Award by the Association for Environment Conscious Building in 1997. The site's main features start with the re-use of contaminated industrial land and extend to the use of locally sourced, sustainable materials such as timber and waste slate, organic paints, controlled passive solar design, low energy lighting and high levels of insulation in the walls and ceilings. The unit has been described as having the lowest embedded energy costs of any building surveyed so far by experts in this field.

Working throughout the world, the company has always maintained strong roots in mid-Wales where it is based. This year, Dulas completed a 500 kW grid-connected small hydro power scheme in North Wales. Last year it designed and installed solar and wind systems to power traffic monitoring and signalling equipment on major approach roads to the new Severn Bridge.

IPE bids to monitor carbon emissions trading

London's International Petroleum Exchange (IPE) has announced a proposal to establish a traded market in carbon dioxide emissions in order to secure what it calls maximum environmental benefits at minimum economic cost. The proposal has been submitted to John Prescott, UK Deputy Prime Minister and to the European Commission.

One of the most important principles to emerge from the Kyoto international treaty to combat climate change was that of a market-based solution to pollution problems. Following Kyoto, John Prescott challenged the City of London to develop a mechanism for trading emissions permits.

Legislation is key for the establishment of a market, as without strictly enforced rules, carbon dioxide producers will have no incentive to trade permits, says the IPE. The Exchange is now calling for the UK government to take the lead within Europe by introducing legislation initially in the UK, and lobbying for wider take up within the EU.

The IPE is a strong supporter of a market-based approach to pollution control as opposed to a top down regulatory approach such as a tax on emissions.

Sheffield's 'green heat' energy scheme is ten years old

Deputy Prime Minister John Prescott MP has switched on a new steam turbine as part of tenth anniversary celebrations for Sheffield Heat and Power Ltd (SHP) at Sheffield City Council's municipal waste incinerator. The company, which has been supplying 'green heat' to homes and businesses in the City centre for a decade, is now also generating electricity for sale to the electricity Pool, under the Government's Non Fossil Fuel Obligation arrangements.

SHP supplies over 100 commercial and public buildings and over 3,000 high-rise homes in the City centre with heat generated by burning the City's refuse in Sheffield City Council's municipal waste incinerator. Use of this sustainable source of heat allows many householders and building operators in Sheffield to dispense with boilers altogether - thus avoiding the emission of pollutants associated with fossil fuels.

SHP says that its customers have prevented the release of a third of a million tonnes of carbon dioxide over the last ten years.

The new steam turbine at Sheffield Heat and Power - now a true CHP operator

High street names form Energy Efficiency Club

Many of Britain's biggest high street names have become founder members of a new Retail Energy Efficiency Club (REEC), to help their operations become greener, cleaner and more cost-efficient. Founder members, including Alliance & Leicester, Iceland, John Lewis Partnership, Safeway, Sainsbury and WH Smith, have joined the club to share information and advance knowledge on every aspect of energy use, from heating, lighting, air conditioning and refrigeration, to staff and customer comfort.

The club has been set up by energy consultants EA Technology, based near Chester. "The club is designed to be of value to anyone with retail premises, including banks and building societies, and is working on a wide range of energy issues facing the retail industries," said EA Technology business development manager Steve Holmes.

The format of the club is based closely on EA Technology's Strategic Technology Programme, which is used by the major players in the UK electricity industry to carry out research and technology-sharing on all aspects of energy.

REEC members vote on energy-related issues they would like to pursue further - for example, assessing the energy efficiency of new equipment, improving the control of heat curtains or the use of alternative refrigerants - and will use EA Technology's extensive research facilities to provide impartial advice and testing.

Meacher proposes sustainability indicators

Environment Minister Michael Meacher has suggested that energy consumption, along with other important measures like the number of days of high air pollution, water quality and resources, biodiversity, the character of the countryside, and the consumption of natural resources should soon be reported alongside the retail prices index and unemployment on the evening TV news.

Speaking in London, Mr Meacher was discussing a set of indicators to measure whether we are achieving more sustainable development.

He said: "In future, the government's performance should be judged not just on growth in GDP and the rate of inflation, but also on how good is our air quality, how well is biodiversity being protected, how healthy are our citizens and how well equipped are they to participate fully in society."

Mr Meacher set out the issues which he felt should be included in the headline set of indicators: climate change, air quality, water quality and resources, biodiversity - our wildlife and habitats, the character of the countryside, consumption of natural resources and the associated issue of waste; together with important economic and social indicators, perhaps including health, equity, employment and education.

Gas pipeline operator Transco is using flame ionisation detectors from Telegan to investigate suspected gas leaks quickly and accurately. Nearly 2,000 of Telegan's portable Gas-Tec detectors are used by Transco Emergency Services engineers across the country. With a typical response time of under two seconds, the units are able to detect hydrocarbons in concentrations as low as 0.1 ppm.

ScottishPower signs long-term coal deal

ScottishPower has signed a £300 million, six-year deal with Scottish Coal which should help ensure the future of the Longannet colliery, the last remaining deep mine in Scotland. Under the agreement, ScottishPower will take around 1.7 million tonnes a year from the Longannet mine until 2004.

The front-ended financing of the deal, providing extra cash during the early years of the contract, is specifically designed to help Scottish Coal develop its Kincardine reserves. Adjoining the existing Longannet mine workings beneath the Firth of Forth, these coal reserves are among the biggest in western Europe.

In a parallel but separate five-year deal worth around £100 million, ScottishPower will buy 750,000 tonnes annually from Scottish Coal's opencast sites throughout Scotland.

The latest twin agreement replaces a five-year deal which committed ScottishPower to some 2.3 million tonnes of opencast and deep mine coal each year. This coal supplies the main needs of the Longannet and Cockenzie power stations.

NVQs - helping meet the

by Mary Powell FIPD

West Burton coal-fired power station - 66 staff have completed NVQs, leading to measurable improvements in performance

Established now for ten years, National Vocational Qualifications have gained credibility; employers are using them to help bring about changes in culture and attitudes, and improvements in performance. Here, Mary Powell sets out the background to NVQs and illustrates how they have made a major contribution to improving the operation of a power station.

A major shake-up of vocational qualifications in the UK was begun in 1986 when the Government set up the National Council for Vocational Qualifications (NCVQ) to introduce the National Vocational Qualification (NVQ) framework and ensure that work-based qualifications met particular criteria and were broadly comparable across different employment sectors.

Introduced in 1988, National Vocational Qualifications (NVQs) are qualifications based on defined occupational standards, are quality assured, and reflect the knowledge, understanding and skills an individual possesses in relation to a specific area of work. NVQs are available at five levels, defined in QCA's general guide to the NVQ framework, ranging from:

- Level 1 - Competence which involves the application of knowledge in the performance of a range of varied work activities, most of which may be routine and predictable, to
- Level 5 - Competence which involves the application of a significant range of fundamental principles across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and often significant responsibility for the work of others and for the allocation of substantial resources feature strongly at this level, as do personal accountabilities for analysis and diagnosis, design, planning, execution and evaluation.

Increasing provision

The provision of NVQs has grown steadily during the past ten years. NVQs are now applicable across a whole range of employment sectors from agriculture to visual arts, and everything in between. By the summer of 1998, over two million NVQ certificates will have been awarded, with a further million people working towards NVQs (there is no set time limit for achievement of NVQs, which means that candidates can take a flexible approach to completion and attainment of the qualification).

Impressive numbers, but what impact have NVQs had on organisations? The CBI's 1997 report *Reasons to be cheerful* found, from its qualitative study of the use of NVQs and Scottish VQs among CBI member companies, that employers using the qualifications "believe they are valuable tools for business development, and individuals doing them find they provide a unique route to learning and development".

Into a power station

The experience of West Burton coal-fired power station, located in north Nottinghamshire and part of Eastern Generation Limited, appears to support this view. Privatisation of the electricity industry in the early 90s, coupled with the utilisation of new technology, has led to increased competition in the marketplace. Faced with the need to maintain commercial viability, senior management at West Burton identified a need for change in the organisation's culture. Recognising that the expertise and knowledge of staff is fundamental to sustaining and increasing competitive edge, it was agreed that strategic training should play a major part in the required culture change by introducing new working practices, enhancing job skills, and changing attitudes.

challenge of change

A strategy was designed to develop flexibility amongst the employees working in operations, and introduce new working practices which would enable them to carry out basic maintenance activities. This would then free up specialist maintenance staff to undertake more skilled work, and thus improve overall productivity, whilst increasing job satisfaction.

This objective required a programme which would:

- increase the knowledge base, equip employees with additional skills and encourage them to work across traditional job demarcation lines;
- help reassure employees that they had a part to play in the organisation's future, whilst at the same time enhancing their employability;
- provide a mechanism for assessing individual ability and identifying training needs;
- encourage employees to take responsibility for their own continuous learning.

It was agreed that the programme would be delivered in a competence-based modular format, to a large group of employees, in a short time-scale, and in a cost-effective way. The competency-based approach of the NVQ appeared to offer a solution to the development need, and it was decided to utilise the Engineering Marine Training Authority's NVQ Level 2 in Engineering Material Processing, with the addition of a module on Power Station Plant Routine Maintenance, endorsed as an additional unit to the NVQ.

Training was provided by the West Anglia Training Association, with the NVQ programme being managed by West Burton's Training Officer, Steve Walker, who worked closely with the participants' line managers to ensure that the NVQs were delivered with minimal disruption to operational activities.

Results at West Burton

When senior management at West Burton were considering how best to commit to the multi-skilling programme for operations employees, they appreciated that it could be effected without using NVQs. However, it was also clear to them that the attainment of nationally recognised qualifications demonstrating competence against national standards would give credibility. With 66 employees having successfully completed NVQs in Engineering Material Processing, and a further 18 working towards the qualification, those who have attained NVQs are seen to be:

- confident in their own abilities, and comfortable with the concept of continuous learning,
- demonstrating additional skills and knowledge,
- able to seek qualify solutions to identified work problems.

This has contributed to identifiable benefits in overall performance such as:

- a reduction in outstanding safety defects on the Station's defect reporting system,
- a 10% increase in the number of defects rectified by operations employees over a one-year period, resulting in a significant contribution to cost reduction,
- work now being carried out across traditional demarcation lines - increasing plant availability, and more effective utilisation of skills.

Mary Powell is an independent Personnel Consultant who has been researching a series of case studies for the Qualifications and Curriculum Authority on 'bottom line' benefits of NVQs. She can be contacted on 0171 820 8128.

Hamworthy Combustion Engineering (HCE) believes its training facility is second to none - attracting the world's oil, energy and industrial process companies and helping them to gain the maximum benefit from the burner and control systems it supplies.

From control software, debugging and electrical fault finding, to combustion chemistry and basic maintenance, the company believes the lessons learned can be fundamentally important for course participants in their ongoing use of HCE burner products.

The training facility has a dedicated team of lecturing engineers for all HCE products, operating from the company's UK headquarters in Dorset, or at customers' sites anywhere in the world, onshore of offshore. Product manuals are actually written by these training department engineers, who therefore offer extensive knowledge - from design, through development, to production, service and maintenance.

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Energy education - into

by Louise Evans, Deputy Secretary & Chief Executive, The Institute of Energy

A recent Government Green Paper:* The Learning Age - a renaissance for a new Britain *put "learning at the heart of its ambition". Here Louise Evans looks at how the Institute is already playing its part in raising the profile of energy and environment issues in education, and how that role could be extended.

Readers of *Energy World* (see January 1998 issue) will recall that the Institute last year held its first round table discussion on energy and environment education, chaired by Immediate Past President Professor John Chesshire. Since then the Institute has been represented at a variety of meetings with other interested parties. As Energy World went to press the Institute was hosting a second debate, chaired by an independent education expert, to discuss the requirement for a national coordinating body to stimulate and drive education in this area. The outcome of this debate will be reported in a future issue of *Energy World*.

There is little doubt that new policies to drive education and learning for all groups within society will generally be warmly received. However, learning experts will be asking some tough questions to ensure that Government policy is workable. Those developing education and learning opportunities will need to interpret the requirement for individual and group needs to be assessed; the backgrounds and past experiences of those taking training need to be taken into account. While many groups will willingly commit to this new era, more innovative efforts will be needed to entice in those currently excluded from learning for a variety of social and economic reasons.

In a time when energy and environment have crept quietly up the political agenda, it is important that organisations like the Institute work with Government to introduce energy and environment topics as "essential learning" for this new age. As an organisation which spans generations of learners and different learning groups with individual needs, The Institute is well placed to work with like-minded organisations to stimulate more partnerships between Government and industry to make the Learning Age a reality. Cast your mind back to recall what the focus of The Institute of Energy is - it is about supporting you in your professions to learn, develop and demonstrate your competence within your specialist field; with a wider responsibility to educate others about your profession.

Is there a need for a collective national energy and environment education policy and support network to implement training and education in this area? To answer this, we need to consider where we are now and determine where we need to be to achieve the ideal of ensuring that everyone has an opportunity to learn about their environment and react with a positive contribution to conserving it. The real opportunity lies in education beyond campaigning; small concerted efforts by each 'learning' person will contribute towards achieving the goals set at summits like Kyoto last December.

Today's picture

So where are we now? The Institute does not, by any means, claim to be undertaking an exhaustive list of the activities required. This in itself raises an issue of fragmentation - perhaps something that the University of Industry is being developed to solve, especially where community education is concerned. What we do have is current and developing partnerships with Government, industry, academia, other non-Government organisations, trades unions and public sector organisations that help us to piece together parts of the jigsaw picture of the learning opportunities that do exist. Two immediate opportunities identified as *missing* pieces include: bringing industry and graduates closer together, and introducing an action awareness programme for the UK workforce to support current management and technology programmes.

In pre-16 education we are aware that CREATE (The Centre for Research, Education & Training in Energy) is actively working with member organisations and sponsors to raise the profile of energy and environment education within schools. Many members of the Institute also visit their local schools to provide careers talks. Currently the National Curriculum includes these topics mainly via geography and biology, but should energy and environment warrant enough importance to exist in their own right?

Some would go so far as to suggest that energy and environment should constitute part of the key skills mix, as one way of ensuring that pupils are exposed to these topics and develop tangible skills as a result. Energy engineering and environmental studies usually appear later in the learning journey in higher, further and university education. Energy and environment are also wrapped up in mechanical, electrical and chemical engineering courses. Currently there is a welcome increase in BSc and Masters courses, especially where environment is concerned.

Moving on to vocational education, readers will be aware of the Institute's involvement in a partnership with the DETR Energy Efficiency Best Practice Programme to develop occupational Standards for Managing Energy. This is the first national benchmark and basis for the S/NVQ in Managing Energy Level 4 qualification and the first 'engineering profession-related' VQ to form part of the criteria against which potential members can be assessed for membership of the Institute.

There is, the Institute believes, also a place for vocational learning in these topics at the lower levels of the system (primarily levels 2 and 3). Individually accredited VQ units in energy efficiency and environment awareness are popular with some, whereas other groups believe there is a demand for

the learning age

a full environment VQ at Level 2. As you can see, this is yet another debate within a debate. National Energy Action, for example, has completed some excellent work with City & Guilds in providing VQs in thermal insulation at Levels 1 and 2. This very much complements their role of campaigning for warmer homes, especially for disadvantaged groups.

Reaching out

But what about the rest of the 'learning public'? How far does one go beyond the educational promotional campaign - or is that enough? Are we simply using the wrong messages to communicate, or are we really making an impact and changing attitudes? Organisations like the Energy Saving Trust might argue that public awareness has greatly increased following their public information campaigns on behalf of the Government. They may well be right, but do we see hard evidence of these learning experiences replicated in our everyday lives? Perhaps not, and some critics in the energy field have suggested that only sharp rises in energy prices or new legislation will really facilitate changing attitudes.

The Institute is currently immersed in reviewing its own education services and provision to address many of the concerns mentioned. Committees are already seeing positive results. Committee groups have been re-organised to work proactively in specialist areas; all members involved will be receiving further training themselves to maintain standards and currency of competence. University, higher and further education programmes are being given additional support in their development, construction, accreditation and approval.

One goal for the future is the appointment of academic liaison officers within Institute-approved and accredited universities for each Institute Branch. Also, membership and education advisors within Branches could ensure regular contact with students, recruit Student Members and help them to transfer to Graduate membership. They could also assist university departments to modify and develop their courses.

A Young Members section, a mentoring network and dedicated newsletters for each specialist group within the membership are further goals. Bringing industrial Group Affiliate members into closer contact with high calibre students and graduates is another, shorter term objective. You can see that the Learning Age is already being establishing within the Institute as we continue to ensure that learners get maximum access, flexibility and forward thinking via the learning opportunities that we promote. This work in turn continues to raise the profile of the people and the profession.

There are no easy or immediate answers to the questions posed here. But we are taking steps in the right direction. What we have to safeguard against is creating newly skilled, increasingly employable individuals and then being unable to offer the employment opportunities they seek. This problem requires action to redress the balance of effort between education and employment growth. As long as we are prepared to break down the barriers to learning, and the inequality these can foster, we will continue to evolve into a learning society.

The Institute is always keen to hear the views of its members on key topics, so please write to Louise Evans at the Institute or e-mail: levans@ioe.org.uk. For further information on the Institute's education developments please contact Tracey Fisher, email: tfisher@ioe.org.uk

The 'individual case' route to Chartered status

by Tony Pearce - Director, Masters Engineering Programme, The Open University

The Open University now offers a 480 point, Master of Engineering degree which aims to give Open University students the opportunity to meet the new SARTOR education requirements for Chartered status in Engineering by the Individual Case route. The degree programme has been developed over the last two years in close consultation with the Engineering Council, the Engineering Employers' Federation and the Institutions of Electrical and Mechanical Engineers.

The degree was planned to be equivalent in the standard reached by candidates to that of the four year full-time MEng degree offered by conventional universities. It provides candidates with the opportunity to undertake part-time study with the aim of meeting the Engineering Council educational requirements described in SARTOR 97 for registration as a Chartered Engineer by the Individual Case route.

The programme is designed to allow relevant previous study to count for up to 330 points, making this degree an ideal SARTOR, 'Matching Section' for BSc/BEng graduates of conventional universities. Candidates are able to work and undertake professional development whilst following a 150-point, part-time route to the MEng degree and the opportunity to meet the new Engineering Council educational requirements for registration as a Chartered Engineer.

Candidates may join the programme, which starts and finishes with compulsory 15 point courses at any time during their studies. These compulsory courses aim to develop in candidates the skills of reflection, communication, working with others and improving own learning and development.

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From space flight to the potential for fuel cells in transport

The principle of the fuel cell was first demonstrated in London over 150 years ago. In its early days, it was hoped that the opening of the 20th century would mark the commencement of the 'age of electrochemical combustion'. In reality, scientific problems encountered in moving from the laboratory bench to commercial reality proved insurmountable and it was largely the heat engine, firstly using steam and latterly gasoline, oil and natural gas which has proved the workhorse of this century. One hundred years after these early aspirations, it looks as though the fuel cell may be coming of age at last. One thing is certain: the 21st century will be the age of major change and, despite some of the doubts voiced in the recent past, it is now clear that the fuel cell will play a significant part in that change. The only uncertainty is the degree of penetration it will achieve in a market demanding ever cleaner power sources.

This article is based on a paper presented at the First International Conference on Energy & the Environment, held last year in Cyprus

The fuel cell is an electrochemical device and can be envisaged as an electrolytic process in reverse. In its simplest form, the fuel supplied is hydrogen and the oxidant is oxygen - power will be produced as long as these are continuously available. Efficiencies as high as 73% can be achieved in this way. Indeed, in this form, fuel cells have provided power very successfully for manned space flight for many years.

For terrestrial applications, numerous problems must be overcome. The most convenient oxidant is air, which results in a loss in performance due to the parasitic presence of nitrogen. Price is a major issue since, for example, astronautic devices may cost as much as $10,000/kW; this requires a ten-fold reduction for competitive market entry for stationary applications and much more for transportation. Longevity is another issue, since commercial customers are likely to require lifetimes in excess of 40,000 hours.

Fuel type is another fundamental question: hydrogen giving by far the best performance but creating numerous economic problems. Hydrogen is expensive compared with natural gas, which is the most readily available fuel, and on-board storage for vehicles is a long-established difficulty. High pressure gas, or low temperature liquids are costly to produce and metal hydride storage systems are expensive. The favoured options at present are:

- Natural gas for stationary applications, requiring fuel processing or reforming to convert hydrocarbon fuels to a hydrogen and carbon monoxide mix. This may require an external chemical plant (which is expensive and saps performance) or the development of more advanced, higher temperature fuel cells where reforming can be carried out internally: so called external or internal reforming respectively.
- Methanol or hydrogen for vehicles. The former offers the convenience of an easily handled liquid fuel, but again requires an on-board reformer. The latter gives better performance but suffers the problems described above. There is no clear view as to which of these fuels will be the ultimate choice: hydrogen offers simplicity and better performance on the vehicle - methanol offers lower cost but greater complexity.

Having overcome the fuel supply problems, the basic cell stack must be supported by power electronic systems to convert its DC output to usable AC, again incurring costs and parasitic losses. The balance of plant must also provide for gas flows and thermal balances for the heat and mass transfer processes.

Fuel cell types

Table 1 summarises the various types of fuel cell under development, and the initials by which they are known. Each is designated by its electrolyte and operates at a specific temperature, or temperature range, as shown. Waste heat is delivered at a level linked to the operating temperature, and is a valuable bi-product.

The SPFC is the preferred type for transport and has evolved from highly developed astronautic variants. It is a low temperature device. The PAFC is closest to commercialisation. Both it and the SPFC require the added complexity of external fuel processing.

The high temperature MCFC and SOFC are still at the developmental stage, although the former is being demonstrated pre-

Table 1 Fuel cell types

	Type of fuel cell	Oxidant	Fuel	Operating temperature °C
PAFC	phosphoric acid	clean air (without CO_2)	pure H_2 (hydrocarbons)	200
AFC	alkaline	pure O_2 + H_2O (without CO_2)	pure H_2	60 - 120
SPFC	solid polymer	pure O_2	pure H_2	60 - 100
MCFC	molten carbonate	air + CO_2	hydrocarbons	650
SOFC	solid oxide	air	any fuel	900 - 1000

laptop computers - and power

by Martin Fry, Martin R Fry & Associates

commercially at present. High temperature operation offers the prospect of internal reforming yielding higher performance and greater plant simplicity.

The AFC is another example of astronautic technology and, although much effort has been made to develop a commercial version, this is now thought unlikely to succeed. The Direct Methanol Fuel Cell (DMFC), on the other hand, is not shown in the table but has been receiving considerable research funding in recent years. It is a low temperature device, driven by methanol liquid or vapour reacting directly on the anode surface. Although efficiencies of only about 30% have been achieved, no fuel reformer is required thus bringing simplicity and lower cost, compared with the SPFC, for transport applications. The DMFC is further back on the development path but it is the potentially simple, low first cost solution to the transport challenge which has helped to attract much of the funding.

Benefits

The fuel cell has the potential to offer improved environmental performance compared with established power generation technologies, in terms of emissions and lifetime operating cost. Its modular nature means that its performance and specific costs are far less sensitive to power capacity, opening up niche markets, for example, at the low power range. Operation at temperatures below that of normal combustion indicates that NOx levels are essentially zero. The lack of moving parts (apart from pumps) leads to negligible levels of noise and vibration.

Applications and markets

The fuel cell is essentially a combined and heat and power plant, requiring a larger footprint than its engine based competitor, but this is not seen as a significant disadvantage in most applications.

In principle, scale is not a major problem since the essentially modular nature of the device means that it can be fabricated to an output dictated by the market with far less difficulty than conventional technologies. In addition, the basic stack can be integrated with gas or steam turbine plant to increase overall efficiency (and, of course, complexity) and a large number of studies have been carried out over the years with this in mind, initially aimed at direct competition with large

British company develops PEM cells

Established in 1995 and based in Loughborough, Advanced Power Sources Ltd (APS) has reached the technology demonstration stage in developing polymer electrolyte membrane (PEM) fuel cells and related technologies.

Modular power pack units with power ratings from 10 W to 5 kW will be available later this year, says the company, which designs stacks for simplicity of construction and to use low cost components. APS has identified several potential applications for PEM technology in the battery replacement market, including portable power packs, metering, sensors and other stand-alone devices.

The photograph above shows a portable power pack (nominal power 25 W).

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central power plants.

A viewpoint in the late eighties was that the fuel cell could one day replace most of these. However, the last five years have seen major advances in conventional plant performance, especially in the case of combined cycle technology, which is now approaching 60% efficiency at power plant sizes in the hundreds of MW range. Although a fuel cell incorporating a turbine driven from the exhaust could probably exceed this figure, it must be recognised that the combined cycle plant is already a commercial success and even the simplest fuel cell has yet to reach that status: less challenging market entry points are needed.

Phosphoric acid fuel cell (PAFC) plant

The key to success is the identification of these targeted markets in two broad categories. The first is where conventional technologies become limited in performance or very expensive on a specific power basis. Examples include:

- Reciprocating engines below about 30 kW, which are not commercially viable as the basis of CHP plant, because efficiencies may fall to between 20 and 25% and specific costs rise to several thousand pounds per kilowatt, compared with about £500/kW for larger units. There is very significant market potential for products in the 1 - 10 kW power range, for example, which could include domestic cogeneration.
- Power plants below about 1 kW, which hardly exist apart from lawnmowers and handheld power tools. In these ranges, engine efficiency falls rapidly and may be as low as 5%. There are emerging global concerns about the emissions from the mushrooming population of these devices. An efficient replacement would find enormous markets and there is already demand for battery powered chainsaws, as an example of market dissatisfaction with existing products.
- Replacement of secondary batteries, especially for laptop computers and mobile phones, where costs may be as high as £10,000/kW and where there is enormous potential demand.
- Specialist applications, such as power sources for intelligent gas meters at remote sites (where there is no grid power and conventional batteries prove too expensive in terms of maintenance).

The second, and perhaps most exciting but challenging market is that of transport. It is clear that a replacement for the reciprocating engine must be found, especially for city centre applications. Battery vehicles have been under development for many years and are now very close to market. Undoubtedly, there is a demand for them and local legislation (such as that in California) is providing an important stimulus. However, unless there is a breakthrough in battery technology, which seems unlikely, vehicle performance will remain unattractive for applications other than city centres or relatively short journeys.

The fuel cell could have a major impact here, either in its own right or as a battery-hybrid. Its potential has now been recognised by some of the world's leading motor manufacturers and some details of current activities are provided in the next section.

The challenges are enormous. Costs of mass produced automotive engines are as low as £30/kW and units are compact, posing major problems for the larger footprint fuel cell. But real progress is being made and the rewards are equally enormous.

A recent market study by EscoVale *Fuel Cells, Applications and Opportunities,* takes a more cautious view than many, but still paints a very encouraging picture. The forecast envisages fuel cells capturing a multi-billion dollar share of the stationary power market by 2020. This equates to an overall penetration level which is still some way short of 10%, but this represents a requirement for more than 10 GW per annum by that time. The main applications fall within the distributed generation catchment area, with substantial opportunities for several low temperature and high temperature fuel cell technologies, across a power range from a few kW to 10s of MW.

Another early market for fuel cells is to be found in the portable power/battery substitution area, at lower power levels (from a few Watts to low kWs). The report forecasts a requirement running to millions of units per annum, although unit values are such that the market is worth a good deal less than those in stationary power or in transportation.

Transport is predicted to emerge as the largest fuel cell market by 2020. Naturally, comparisons need to take account of profound differences in duties, specifications and price levels. However, EscoVale's analyses suggest that vehicular and other transportation applications will be well ahead in terms of aggregate capacity.

International programmes

Technology from the US predominates for stationary applications and that from Canada is close behind in terms of transport.

USA

The PC25 PAFC is manufactured by International Fuel Cells and is available in Europe through Ansaldo in Genoa. It is now a commercial reality as a 200 kW packaged unit, available at about $3000/kW. Its maximum power efficiency is about 40% which is about eight percentage points higher than engine based competition at that scale. Another key factor is that, at the 50% power level, the efficiency rises by two points, whereas an engine's falls by about the same.

Just as importantly, its operational reliability and availability are significantly better than the competition and a recent development is that the technology is now seen as a contender for the uninterrupted power supply market. For example, the Sacramento Municipal Utility uses the PC25 as the prime supply and the grid as a backup. It is also strongly emerging in the city centre for embedded cogeneration.

Despite, at present, being more costly than conventional competition, the PC25 is finding a market with more than 100 units now manufactured. Many are installed in Europe (at least five in Germany alone), although none in the UK to date.

SOFC CELL POWERS DUTCH COMMUNITY HEATING SYSTEM

Fuel cells of the solid oxide type may become commercially available as standard products as early as 2001 - according to Raymond George, department manager of the SOFC Power Generation section of Westinghouse and speaking at the commissioning of the world's largest SOFC so far, in May this year. A consortium of Dutch and Danish companies has installed a 100 kW SOFC unit from Westinghouse at Westervoort, near Arnhem in The Netherlands, in order both to promote the use of fuel cells and gain operational experience.

The plant supplies electricity to the Dutch electricity grid and heat to fuel the local community heating system, which has 4000 domestic connections. Fuelled by natural gas, the fuel cell produces enough heat and power to supply the demand of around 200 homes.

Westinghouse have been developing a tubular version of the SOFC for some years and have run a number of demonstrators at 25 kW and, latterly, 100 kW which is now being demonstrated in Europe through a consortium of Danish and Dutch utilities *(see box left)*. Notwithstanding earlier comments, they are now believed to be developing a 3 MW unit incorporating a 1 MW Heron integrated gas turbine, which they expect to deliver 70% efficiency overall.

In terms of transport applications, Chrysler are now developing a gasoline powered fuel cell car, which they expect to demonstrate within two years, with production prototypes ready by 2005. They talk of near zero emissions and performance at 80 mpg. The power plant will be supplied by Ballard, see below, as part of a $3 million programme.

Canada

Ballard Power Systems are now firmly established as the world leader in SPFC technology for transport, with several fleets of buses shortly to be demonstrated, along with the automotive applications above. There is little doubt that this technology is now beginning the not insignificant task of swinging the motor industries of the world away from engine based power trains.

Six vehicles have been delivered to Chicago and Vancouver for a 'city streets' trials programme.

Japan

A large number of Japanese companies are involved at different stages. For example, Fuji have a PAFC design and Toshiba are closely linked with IFC, contributing to the power electronics of the PC25. They also have an 11 MW demonstrator in Japan, using IFC technology. There are numerous MCFC and SOFC developments. A 1 MW MCFC test facility, comprising four modules, is expected to be operational next year

IHI are one of two companies in the world developing reformer technology, for which there is a universal demand.

Toyota have recently announced that they have developed a hydrogen fuelled 20 kW SPFC/lithium hydride battery powered car. They also are actively involved in other transport applications including a car powered by a 45 kW motor - claiming 250 km on 2 kg of hydrogen supplied to a fuel cell.

Europe

ECN/BCN in the Netherlands have developed MCFC technology. ARGE DFC (a consortium of MTU (Daimler Benz), Haldor Topsoe and three utility companies) have recently announced the development of a system for transport. Haldor Topsoe is the other major company developing reformer technology. Siemens have reached the 10 kW demonstration stage with their planar SOFC design.

Daimler Benz have developed the NeCar, fuelled by compressed hydrogen and employing an SPFC power plant from Ballard (see *Energy World* January 1998). Two 25 kW stacks are accommodated under the rear seat, without affecting storage space.

United Kingdom

An industrial programme is slowly emerging in the UK, alongside an academic research community, much of which is operating at the world class level.

As examples, Johnson Matthey have been actively involved in fuel cell research for some years and now supply platinum based electrode assemblies to Ballard, which feature in the North American and German based demonstrations referred to above.

Rolls Royce are developing their own planar SOFC design, as the basis of a cogeneration unit. The recently launched company Advanced Power Sources is concerned with the commercialisation of small scale SPFC designs developed at Loughborough University *(see box page 13)*.

Woking Borough Council are giving serious consideration to the installation of a fuel cell demonstrator as a heat and power supply for their Leisure Centre. This would be a very important step, representing as it would, a first for the UK.

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Fifty years - from coal energy services

Lord Ezra giving the Idris Jones Memorial Lecture at Cardiff Castle

Lord Ezra has been continuously involved in the energy sector since June 1947. Thirty five of those fifty years were spent at the National Coal Board and fifteen in companies providing various forms of energy service. Lord Ezra gave a personal review of his experiences as the 25th Dr W. Idris Jones Memorial Lecture, delivered at Cardiff Castle on 27 March 1998. This article is based on that review.

Coal has loomed large in my working life. Therefore I begin by recalling briefly what has happened in the coal industry in the past half century.

When the coal mines were nationalised in 1947, two world wars and major inter-war disputes had taken their toll. From the peak production of 287 million tons in 1913, deep mine coal output had fallen to 181 million tons in 1946. In response to strong demand in the aftermath of war, output was built up to over 210 million tons by the mid 1950s but then, as the market weakened, fell back progressively, with intervening periods of stability, to 28 million tons in 1997.

In the same period of 50 years the number of collieries (excluding small mines) fell from over 900 in 1947 to 24 in 1997. The number of mineworkers fell from over 700,000 in 1947 to 12,000 at the end of 1997. Productivity moved in the opposite direction. As mining technology improved and less economic mines were closed, productivity moved up throughout the period and really took off after the 1984 strike and the accelerated closure programme that ensued.

Chairmen of the Board

I served under four chairmen of the National Coal Board before becoming chairman myself. All four were remarkable personalities. The first chairman was Viscount Hyndley who had played a prominent part in coal policy in both world wars. He was regarded as a sort of father figure in the industry and was benign and friendly. His deputy chairman was a very able former civil servant, Sir Arthur Street, who was responsible for creating a coherent organisation out of the mass of colliery and other assets vested in the Board. Street died early in 1951, otherwise he would no doubt have succeeded Hyndley as chairman.

In the event the next chairman was Sir Hubert Holdsworth, who had been a successful and outspoken chairman of the East Midlands Division and had a legal background. His task was to continue the expansion of the industry to meet the continuing strong demand for coal at that time.

He was succeeded by Sir James Bowman, who was a leading personality in the mining union and dedicated himself with vigour to the industry. He came in at a difficult time because the market changed in the mid 1950s and competition from oil intensified. The previous expectations of ever increasing demands for coal disappeared almost overnight.

He was succeeded in 1961 by Lord Robens, an altogether exceptional personality. Alfred Robens had been a member of the Attlee Cabinet and was a leading figure in the Labour Opposition when the Prime Minister, Harold MacMillan, invited him to go to the Coal Board. This was an inspired choice. Robens came in at a time when pressure on the industry was mounting and substantial pit closures were inevitable. He handled the situation with great skill and understanding. Mineworkers were offered jobs at other pits and their families given every facility to settle in the new locations. Thus, what could have led to a highly critical situation was handled in a positive and successful manner.

nationalisation to

I joined the coal industry quite by chance. One day in May 1947, while still in uniform, I met an army friend who was Director of Transport at the newly formed National Coal Board. He suggested I applied for a job with their marketing department who needed people. This I did and was duly taken on. One of my first tasks was to unravel some of the coal sales agreements that the previous mine owners had made before nationalisation. There was a particularly important agreement in South Wales set up by Powell Duffryn and Stephenson Clarke, their marketing subsidiary. This meant that while the Coal Board produced the coal, they had no say over its disposal, an obviously unsatisfactory position.

Now many of the people that came into the Coal Board at that time had of course been employed in the industry under private ownership and the Director General of Marketing was Sir William McGilvray, who had been at the top of the Stephenson Clarke organisation. He said to me that there was a fatal flaw in the sales agreement which, if discovered, could enable it to be broken. We spent months trying to find this flaw but never did so. We finally had to buy our way out of it at considerable cost.

Origins of the EU

My next major assignment was to do with the European Coal and Steel Community which was formed in 1950. The object was to start a new chapter after the War and to bring Germany back into the fold. The proposal was that the coal and steel industries of the West European countries should be brought together in a single organisation with common rules. Britain was invited to participate. A working party was set up to advise the Government, with coal and steel representatives. I was the coal representative. Our recommendation was that on balance it would be desirable for us to join in with the other countries. However, when this got to the Cabinet it was turned down. I believe that Britain's role in Europe would have been much more effective had we joined at that stage.

The Government subsequently decided that it would be desirable for us to keep in touch with the newly formed Community and agreement was reached with Jean Monnet, the President, to send out a UK delegation to Luxembourg, which was their headquarters. I was appointed to represent the coal industry on that delegation and stayed there for four years.

This was a seminal period in the development of European integration in which the latest step has just been taken with the agreement on the single currency. Through being in Luxembourg and in touch with the High Authority, we were able to get a clear understanding of what was involved and how the Community was developing. This was very valuable when we eventually joined what had then become the European Economic Community in 1973.

I was recalled to London in 1956 and in due course put in charge of the London sales office. We were then in the midst of a sales crisis. This was a situation utterly different from when I joined the Coal Board in 1947. Then coal supplies were severely rationed. Now we had to go out and sell. This meant not only strengthening our sales force and introducing sales engineers to advise customers on how best they could use our product, but also seeking to transform the attitude of the production side of the industry. No longer was it possible for them just to produce coal and leave it to the marketing staff to sell it. The sales operation began at the pit itself. The coal had to be produced in qualities which suited the customer. Eventually this got through and some of our most ardent salesmen were the men working at the pit. I made a point of taking important customers to visit collieries where the coal they used was produced. These visits stimulated the mine management and mineworkers and impressed the customers.

Handling coal closures

In 1967 I was appointed Deputy Chairman and was more widely involved in the affairs of the industry. I became increasingly impressed with the way in which Alfred Robens handled the issue of pit closures, to which I have already referred. I was present at a meeting which he had with Dick Beeching. Beeching was about to issue his famous plan in which he listed all the railway lines which were to be closed. Robens advised strongly against this. He said the right thing was to handle the closures locally, not to combine them nationally. This was a lesson I took to heart.

When I became chairman in 1971 I ensured that we carried on with that approach. I had much to do with Joe Gormley, who was President of the NUM throughout my period of chairmanship of the Coal Board. At an early stage he said to me "I know you've got to close pits; I'm not arguing against that. So long as you can get agreement locally and have it done without fuss and bother, you won't see me. But, if it gets out of hand and becomes a national issue, then I will come out against you". So we did it all as quietly as we could based on an agreed procedure for local discussion.

Much later, in October 1992, I was surprised when a list of 27 collieries due for closure was published. This went against all the experience of past decades. It led to widespread perturbation and concern.

Looking back on the period when I succeeded Lord Robens as chairman in 1971, it started with great tension because of the two strikes of 1972 and 1974. Miners' pay had got out of line with other pay scales and this was the prime cause of the disputes. When the 1974 strike was settled and work was quickly resumed, we went through a five year period of stability and achievement. The coal situation had been transformed by the oil crisis and so all the production was sold. We were able to make reasonable wage agreements with the mineworkers in spite of substantial and unacceptable claims being put in.

Joe Gormley was a tower of strength at this period. He kept strictly to the rules and when the NUM Executive could not agree he went out to ballot. The results of the ballots at this time showed clearly that there was no

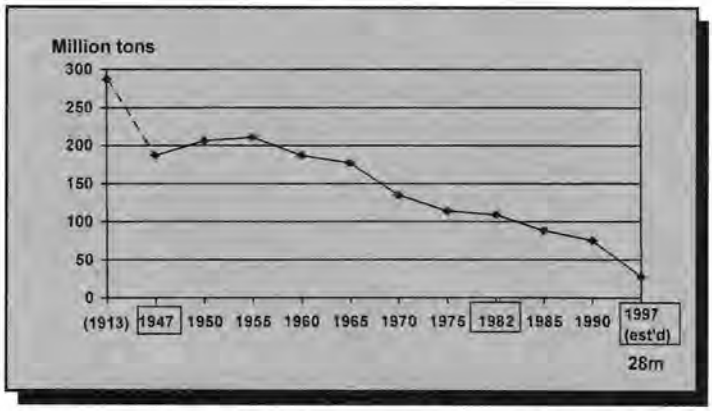
desire for further strike action. I remember on one occasion that Joe rang me to say that he was delighted to tell me that the ballot had gone against them. We carefully prepared for the annual wage negotiations and after tough bargaining always held something in reserve. During the course of one negotiation Joe came up to see me to find out "what was in the cupboard". We happened to settle quite quickly. I thought he would then go back and tell his executive. But he said he had no such intention. "We must spend at least 20 minutes together to show that I have had a tough time. So let's have a drink."

PRIVATISATION

The nationalised coal industry, which started its operations on 1 January 1947, officially came to an end on 31 December 1997. By then the bulk of the assets had been sold back to the private sector. What little remained was transferred to the DTI. Shortly afterwards, Hobart House, the coal headquarters, was demolished to make way for a new development. Even the name will not survive. The many fraught discussions that took place in the board room on the third floor, with its specially built pear-shaped table, the many tense negotiations that took place with the mining unions in Room 16 on the ground floor - all these are increasingly distant memories.

My reflection on the post-war period in mining is that it was not one of continuous decline, as the broad statistics might indicate. In the immediate post-war years there was expansion to meet the pent-up demand for coal which was then the main source of energy. This was followed by the pressure of oil competition in the late '50s and throughout the '60s which in turn was followed by a resurgence in demand for coal in the '70s due to the oil crisis. In the '80s and '90s further recession for the industry set in as the use of gas forged ahead and the energy market weakened. Thus it was a changing scene. We reacted to the changes with vigour and there was much to be proud of. We had a dedicated workforce with intense loyalties to their workplace and employed some of the best mining engineers in the world.

So why has nationalisation in general earned a bad name? It is because the nationalised enterprises were never allowed to get on with the job. The original concept developed by Herbert Morrison was that there should be an arm's length relationship with the Government and that they should intervene only rarely on matters of national importance. But in practice there was continued intervention. Right from the start prices were pegged to the pre-war level and thereafter there was intervention in prices, in investments, in wage negotiations and in all other matters in which Government might have an interest.



Coal ouput, 1947-1997 (excluding small mines and open cast)

ON TO ENERGY SERVICES

In the period following my departure form the Coal Board in 1982 I have been involved in companies promoting energy efficiency in various forms and supporting endeavours to deal with the problem of climate change. Among other activities, I have been chairman of Sheffield Heat & Power, which distributes waste heat from the City incinerator in a piped hot water network, serving public and commercial customers. In the past ten years this has reduced CO_2 emissions by over 340,000 tonnes. I am also involved in the Nottingham Energy Partnership, an imaginative endeavour to achieve within the confines of the City emissions reductions to reflect the Government's objectives. I have been active in the House of Lords in promoting legislation and debates on energy efficiency issues.

From these accumulated experiences I draw two main conclusions.

The first is that it is virtually impossible to project what the energy situation could be in the years ahead. I have already referred to the dramatic market changes that have occurred in the past 50 years. Bearing in mind that the European Union is already 50% dependent on energy imports, a large proportion coming from uncertain parts of the world, and that this is likely to grow to 70% by the year 2020, the question of security of supply is an important one. It is for that reason that we need an energy policy in Britain that takes security fully into account. Coal, with its massive reserves and the great skills of those who work in the industry, must play a major role in this. Because of environmental considerations a special effort needs to be made to promote clean coal technologies.

My second conclusion relates to the environment. In the half century I am writing about there have only been two occasions when energy efficiency was taken seriously. The first was in the immediate post-war period when coal was desperately short and the second was during the oil crisis of the '70s when it was thought that oil would remain short. These factors galvanised people into action. But in the '80s and '90s we have been in a weak energy situation and, in spite of the serious concerns about climate change, market forces have counteracted efforts to increase energy efficiency. A stronger framework of Government policy than exists at the moment is required to achieve the targets agreed at the Kyoto Conference. This will have to be done by providing direct fiscal incentives and disincentives and by specifically promoting such processes as combined heat and power, clean coal technology and the use of renewables.

Solar power satellites - a global energy solution?

by Michael Maylam, British Solar Power Satellite Association

Why not put solar power stations in space and microwave the energy back to earth? Michael Maylam of the British Solar Power Satellite Association reports.

In very simple terms the solar power satellite, or SPS, is a very large collector in orbit around the earth. It uses solar cells to convert the sun's energy into electricity. This is then transmitted down to the earth's surface in a high power, concentrated beam using microwaves. A large collector on the ground, consisting of thousands of receivers, converts the beam back into electrical power.

The advantages of collecting solar energy in space are that:

- the collector is continuously in direct sunlight,
- it is above the clouds,
- it is not subject to corrosion and does need to be cleaned,
- there is no limit to the number or size of collectors - they can be placed in geosynchronous or sun synchronous orbits, on the Moon, or in the gravity free points around the Earth.

The problem is to efficiently get the power back the Earth' surface. This was solved by advances made in microwave technology.

Transmission of power using microwaves was first demonstrated in 1964 at the Spencer Laboratory of the Raytheon company.

Further research culminated in the transmission of 30 kW across 1.6 km at the JPL Goldstone facility in the Mojave desert.

Further laboratory work showed that transmission efficiencies of 91% could be obtained. Microwave beams are virtually unaffected by cloud and rain; they can also be concentrated into tight, very powerful beams.

This work and the fuel crisis in the seventies prompted NASA and the US Department of Energy to commission a reference study into SPS costing several tens of millions. NASA defined the basic parameters and then contracted two studies to Boeing and Rockwell. Both companies did a very thorough report running into hundreds of volumes. All aspects of SPS were examined including environmental impact, resources, orbital delivery vehicles, crew habitats, detailed collector and rectenna design etc. The NASA guidelines stated that two 5 GW SPSs should be implemented each year for thirty years giving a total of 300 GW. Several designs and configurations were examined and NASA combined these to produce a report that put forward a reference study SPS.

The study found that solar power satellites could be built using existing technology, and that energy could be generated at competitive rates. On the down side it was estimated that over one hundred billion dollars would be needed to provide the infrastructure, but once that was in place then each SPS would cost about $10 billion. Like hydroelectric power, which has low maintenance costs and no fuel costs, the SPS would provide very low cost energy once the capital cost had been paid. The design life was set at thirty years, but space debris has been in orbit for that length of time and shows no sign of disappearing.

Barring impacts from meteors, it could be assumed that the SPS could operate over a much longer period. Certainly the materials could be cheaply recycled in orbit to create new satellites. The key factors governing the cost of energy from the SPS are the price and efficiency of solar cells and the cost of transport to orbit. Solar cells have reduced in price dramatically since the seventies and have increased in efficiency. However, the cost to orbit will depend on a new type of heavy lift vehicle being developed capable of putting 500 tonnes into orbit.

The NASA reference study collector was 10 km by 5 km and had a mass of 50,00 tonnes. The transmitter was 1 km in diameter. The ground receiver or rectenna was 10 km in diameter. The maximum microwave density at the centre of the receiver was 230 W/m^2. This would not be harmful to organic matter. As the rectenna is a series of small aerials, the land on which it based could be used for agricultural purposes or left in its natural form.

All of this information was put to the American Congress with concrete recommendations. Despite vigorous lobbying and a large public campaign, the atomic power and oil interests made sure that the whole idea was shelved with no money for any further work. This was a great disappointment to the large number of people who were convinced that the SPS was a viable global energy solution. Many of these people continued research and development, mostly privately financed and an international SPS conference has been held every two or three years. The last conference was hosted by the Canadian Space Agency in Montreal in September 1997.

There, a proclamation was issued calling for global coordination into SPS research to coordinate the launch of a preliminary feasibility demonstration project to be realised over the next decade.

Not surprisingly the Japanese Government has taken the lead, aiming to conduct experiments in space immediately in the new millennium. In a farsighted decision they have initiated the development of a small SPS which they hope to launch as a pilot project. Called SPS 2000, it is a study model of a 10 MW class Solar Power Satellite on a 1,100 km equatorial orbit.

NASA completed a new study in 1997, which highlighted technical advances made since the reference studies. It also concluded that solar power satellites should no longer be envisioned as requiring unimaginably large initial investments in fixed infrastructure before the emplacement of productive power plants can begin. Scientist in many other Space Agencies are continuing development work, especially in China and Russia.

However, the sum total of all of this work is not going to be large enough or fast enough to provide a meaningful solution to our global energy problems. Unless there is sustained public pressure, Governments will not provide any funding. For this reason the British Solar Power Satellite Association is aiming to widely promote the case for Solar Power Satellites in conjunction with other similar organisations around the world.

Contact Michael Maylam, tel: 01785 240388, e-mail: mike@orbfac.demon.co.uk.

Poland - a developing

by Simon Burgess, Director, Energy Technology Promotion Ltd

Biomass could meet an increasingly significant proportion of Poland's energy needs over the next decade or so, if appropriate policies are developed, and local and international organisations seize the opportunities and exploit these extensive renewable resources. And, with Poland in the first wave of countries seeking membership of the European Union, a pro-active approach to renewables could counter concerns about Poland's environmental credentials. Here, Simon Burgess looks at the nature of the Polish energy sector and considers the prospects for biomass.

Poland has experienced massive economical and political changes during the past eight years. These changes have extended to the energy sector which is moving quickly from centrally planned and managed state-owned energy utilities towards decentralised and privatised energy businesses operating in a market economy.

The energy sector is dominated by the hard coal and lignite industries which provide most of the country's energy needs. In 1995 primary energy supply was 95.6 million tonnes of oil equivalent (Mtoe) or 4,003 PJ, of which 75% was from coal, 15% oil, 9% gas and about 0.2% hydro. Primary energy consumption was about 20% lower compared with that in 1987. After a dramatic decline in 1990 consumption has remained relatively stable as the economy has grown. However, it is estimated that by the year 2010 primary energy consumption will increase by 46% compared to that in 1990.

Poland is at present relatively self-sufficient in energy with indigenous resources, mainly coal mined in southern Poland, covering much of the demand for heat and power. However, the energy infrastructure in Poland is significantly less efficient than in the EU; overall electricity transmission losses can be up to 11%.

Although energy is in general half the price of that in the EU, energy costs to an average Polish household are about four times higher.

Electricity - moving towards the UK model

Most of Poland's electricity is generated at 35 large thermal power stations and at large CHP plants, all operating as separate companies (even if not yet in private ownership). Most of the power plants belong to the Polish Power Grid Company (PSE SA) although some are owned by regional electricity utilities and by a number of independent power generation companies.

The Polish Power Grid Company is owned by the State Treasury and is under the supervision of the Ministry of Economy. The PSE SA buys and sells electricity on the wholesale market, and sells to the regional electricity utilities and directly to larger industrial customers. The company is responsible for the refurbishment programmes of the power system (generation and transmission), maintains the high-voltage networks and controls central and regional dispatching.

There are 33 independent regional electricity utilities (RECs), most of which are currently in the process of being privatised. RECs purchase electricity from the PSE SA, local auto-producers and other sources. The RECs, which operate distribution networks of 110 kV and below, are responsible for refurbishment of the local power systems. However, such refurbishments are not, as yet, recognised as a priority for investment.

Many power plants and other elements of the grid systems (especially low voltage transmission) need refurbishment and upgrading. According to the World Bank almost 50% of generating capacity is over 25 years old and needs to be refurbished (or even replaced) in order to meet stricter environmental standards and growing energy demand. The International Energy Agency estimates that upgrading and renovation of the existing power plants as well as the introduction of replacement capacity will require investments of $ 8,000 million by the end of the year 2000. Several relatively new power and cogeneration plants are being adapted for the utilisation of natural gas.

District heating systems need investment

About 50% of Poland's population, and about 75% of urban areas, are supplied with heat from district heating networks. In practice, in most of the municipalities in Poland there are district heating networks, which use in total almost 4,000 km of mains and 6,000 km of distribution pipelines. There are also about 1.5 million low efficiency, usually coal-fired, boilers with capacities below 50 kW, that provide heat to local schools, hospitals and other public buildings.

In terms of centralised heat production, total installed capacity in the form of CHP or district heating plants (DHP) is about 23,370 MW. In 1995, total supply of heat through DHP networks was about 762 PJ.

Many of the district heating (DH) companies in Poland purchase heat from industrial suppliers (both heat-only and CHP industrial plants) and only about one third own their heating plants. The majority of DH companies are owned and controlled by municipalities, although small DHPs are often owned by housing cooperatives. It is estimated that production and transmission losses in Polish DHP are, on average, three times higher than in the EU. In general, the distribution networks as well as the DHP themselves are in rather poor condition, which is particularly evident in smaller towns and rural areas.

The majority of the district heating systems cater for the needs of the local housing cooperatives; typically, these are poorly insulated buildings built to a low-cost design. Although heat metering is becoming more widespread, costs to consumers are often calculated as a flat rate per square meter of living space.

About 99% of centralised heat is produced from the combustion of coal,

market for biomass?

although other fuels, notably natural gas and biomass, are becoming more attractive.

Gas supplies from the east

The overall consumption of natural gas in 1995 was 10.3 billion m^3. However, with the new energy policy, consumption of natural gas is expected to increase to 27 billion m^3 by 2010. Poland recently signed a "take-or-pay" contract with Gazprom of Russia for the supply of 19.3 billion m^3 of natural gas per year. This, coupled with environmental legislation, is likely to create significant pressure on most (if not all) of the larger municipalities to switch from coal to gas to satisfy local heat and power needs.

The Polish Gas Company is planning to construct 10,000 km of new mainline pipelines and 42,000 km of distribution network by 2010.

Prospects for biomass

There are signs that the potential uses of biomass (and other renewables), and the contributions which can be made to the security of energy supply, protection of the environment, diversification of agriculture, job creation and sustainable development, are starting to be recognised. This shift is being reinforced by Poland's desire to acceded to the EU - the eligibility criteria for accession will require candidate countries to demonstrate that their energy sectors have the potential to comply with the requirements of existing EU policies and practices, including the renewables sector.

Some local district heating companies have investigated the possibilities for co-combustion of coal and wood residues, thereby reducing emissions of CO_2, SO_2 and NOx and delaying immediate requirements for capital investment. Up to now, at least five wood-fired district heating schemes, using mainly forestry wood residues, with capacities between 600 kW and 4 MW, have been installed. There is also a large number of applications of small wood gasification boilers (up to 60-80 kW) with at least 60 boilers installed in the buildings belonging to the State Forestry Company and within the area of some National Parks in northern Poland.

Sort rotation coppice (SRC), particularly willow, and other energy crops are being grown to provide cheap biomass as a fuel, mainly for heating purposes. Some of the areas growing SRC are close to waste water treatment plants offering the possibilities to dispose of waste water through natural bio-filters and at the same time increase the yields of coppice.

Poland produces 24 million tonnes of surplus straw a year. Some 13 million tonnes is used for animal feed and bedding although this has reduced significantly in recent years due to changes in agricultural practices and a general lowering of livestock numbers. The most popular way of disposing of the remaining 'waste' straw is by on-field burning. This often causes serious problems to the local environment as well as health and safety hazards. However, there are more than 10 examples where local communities have started to use the waste straw in communal heating systems, replacing old coal boilers with state-of-the-art straw boilers, storage and handling systems. This not only reduces heating costs but helps support local agricultural businesses to develop new sources of income.

Conclusion

In many ways, current developments in the energy sector in Poland reflect the changes taking place in the countries of central and eastern Europe generally. Economic, social and environmental imperatives are becoming ever more important. The transformations to fully-fledged market economies will continue, as will the efforts to join the European Union. Although barriers exist, the greater utilisation of renewables, particularly biomass, can support and be an integral part of these processes. National and local administrations are already implementing measures, and new ones are planned, to increase the share of renewables in the energy mix.

Simon Burgess is Director of Energy Technology Promotion Ltd, a UK-based energy consultancy working in the fields of energy efficiency, renewable energy and the environment. Established in 1993, the company has managed a wide range of European and international projects.
Contact Simon Burgess on tel: 01222 464141, fax: 01222 464500, e-mail: 100712.1444@compuserve.com

New web site aims to help European renewables businesses

A network of energy experts from over 30 European countries have launched a new Internet-based business intelligence service for the renewable energy industry. The EuroREX - the European Renewable Energy Exchange - web site at www.eurorex.com will keep subscribers up-to-date on business opportunities in the rapidly expanding European renewable energy markets. The European market, said to be worth over ECU 4.3 billion a year and is set to grow rapidly.

EuroREX will, says its backers, provide the detailed country-specific information that businesses need to take full advantage of market growth. It will provide an information service at three levels:

- general information - public access site - including links to other sites,
- a twice monthly newsletter - subscriber service, and
- a comprehensive commercial service - subscriber service again - containing frequently-updated briefing information on developments by technology and country, commercial prospects, live projects, new government policies and financial and export information.

Contact Mark Whiteley, tel: 01225 816805, e-mail: eurorex@esd.co.uk

Events

July 1998

European electricity
Conference, 6-7 July,
Brussels, £849
Details from Business Seminars International,
tel: 0171 490 3774,
fax: 01424 773334

Radiological protection
Summer school,
6 - 10 July, Cambridge
Details from IBC UK Conferences, tel: 0171 453 5491, fax: 0171 636 6858, e-mail: cust.serv@ibcuk.co.uk

Power quality - problems and solutions
Seminar and workshop,
8 July, London, £100 + VAT
Details from BSRIA,
tel: 01344 426511,
fax: 01344 487575,
e-mail: bsria@bsria.co.uk

CCGT plant
Conference, 8-9 July,
London, £899 + VAT
Details from IIR Ltd,
tel: 0171 915 5055,
fax: 0171 915 5056,
email: registration@iirltd.co.uk

Metering, data collection & billing systems
Conference, 8-10 July, Brussels
Details from IBC UK Conferences,
tel: 0171 453 5491,
fax: 0171 636 6858,
e-mail: cust.serv@ibcuk.co.uk

Risk management and future contracts for the coal industry
Course, 14-17 July, Teddington, £2175 + VAT
Details from CoalTrans Training, tel: 0171 779 8945, fax: 0171 779 8946

August 1998

Energy 21 renewable energy trade fair
Conference and exhibition,
19 -22 August, Stroud.
Details from Jo Badham,
tel; 01453 752277,
fax: 01453 756571

Greenhouse gas control technologies
Conference, 30 August - 2 September, Interlaken
Details from IEA Greenhouse Gas R&D Programme,
tel: 01242 680753,
fax: 01242 680 758

CIGRE EXPO
Exhibitionof electricity generation and transmission equipment, 31 August - 3 September Paris
Details from IDEXPO, tel: +33 1 4665 1834, fax: +33 1 4663 2600, e-mail: idexpo@wanadoo.fr

September 1998

EXPOGAZ
Exhibitionof gas equipment, 8 - 10 September Paris
Details from IDEXPO,
tel: +33 1 4665 1834,
fax: +33 1 4663 2600,
e-mail: idexpo@wanadoo.fr

Switch on to wind power
BWEA annual conference,
2-4 September, Cardiff
Details from British Wind Energy Association,
fax: 0171 402 7107,
e-mail: bwea@gn.apc.org

International coal supply contracts
Course, 10 -14 September, UK
Details from Coaltrans Conferences Ltd, tel: 0171 779 8945, fax: 0171 779 8946

17th Congress of the World Energy Council
Conference, 13 - 18 September, Houston, US
Details from Houston WEC Office, tel: +1 202 331 0415, fax: +1 202 331 0418, e-mail: hwec98@aol.com

Advances in European environmental policy
Conference, 14 - 15 September, Leeds, £234 + VAT
Details from ERP Environment,
tel: 01274 530408,
fax: 01274 530409

Business strategy and the environment
Conference, 17 - 18 September, Leeds, £234 + VAT
Details from ERP Environment,
tel: 01274 530408,
fax: 01274 530409

Energy efficiency, policy and the environment
World Renewable Energy Congress, 20 - 25 September, Florence, Italy
Details from World Renewable Energy Network, tel: 01189 611634, fx: 01189 611365, email: asayigh@netcomuk.co.uk

Gasification - the gateway to a cleaner future
Conference, 23 - 24 September, Dresden, Germany
Details from IMechE,
tel: 01788 578214,
fax: 01788 577182,
email:
tlepkowska@icheme.org.uk

Modern battery technology
Course, 23 - 25 September, Amsterdam
Details from The Center for Professional Advancement,
tel: +31 20 638 2806,
fax: +31 20 620 2136

Switchgear technology for power systems
Course, 29 - 30 September, Chester, £695 + VAT
Details from EA Technology, tel: 0151 347 2557, fax: 0151 347 2256, e-mail: db@eatl.co.uk

Power-gen Asia
Conference and exhibition, 29 September - 1 October, New Delhi, India
Details from PennWell Europe,
tel: +31 30 2650963,
fax: +31 30 2650928

October 1998

Intelligent buildings: realising the benefits
Conference, Watford,
6 - 8 October
Details from Angela Mondair at BRE, tel: 01923 664775,
fax: 01923 664688,
e-mail: mondaira@bre.co.uk

Understanding heat treatment
Course, 6 - 8 October,
Birmingham
Details from Wolfson Heat Treatment Centre,
tel: 0121 359 3611,
fax: 0121 359 8910,
e-mail: whtc@aston.ac.uk

Gaseous and particulate monitoring
Course, 6 - 8 October,
Cheltenham
Details from CRE Group Ltd,

Obituaries

Midland Branch regrets to announce the sudden death on 12th April of Christopher Postins at the early age of 49 years.

Chris was elected to the Branch Committee in 1988 as Tech.Eng. Representative and became Hon Assistant Secretary in 1991. He was employed in the Energy Manager's Group attached to the City Engineer's Department of Birmingham City Council.

The Institute regrets to announce the death of John Bindon Esq CEng MInstE, a long standing Publications Committee member and contributor to *Energy World*. Our wishes are with his family and the Institute has made a donation to the British Heart Foundation at his family's request.

Energy policy triumphed over Elton concert!

The Scottish Branch of the Institute were proud to host the inaugural Scottish Energy Lecture; "Energy Policy in a Devolved Scotland - Implications of the Kyoto summit" at the Scottish Engineering Centre on the 2nd of June.

The event was sponsored by Scottish Enterprise with support from the Scottish Office and was attended by 75 energy professionals who competed with the traffic caused by an Elton John concert to make sure they were there!

We were privileged to have the services of our President Professor John Chesshire as Chairman for the evening debate. Delegates were welcomed with wine and canapes and the opportunity to address the speakers on the conclusion of presentations from John Brown, Scottish Energy Efficiency Office and David Sigsworth, Scottish Hydro-Electric.

Should you wish to learn more about the event, or purchase the presentations given by the speakers contact Maria Adams on tel: 0171 580 7124.

Branch Events

AUGUST 1998

NORTHERN IRELAND
(tba)
Visit to AVX (possible committee meeting), Coleraine.
Contact Dr P Waterfield, tel:01232 364090 email: p.waterfield@ulst.ac.uk for more details

SEPTEMBER 1998

NORTHERN IRELAND
Wednesday 9 September
12.30pm
Committee Meeting
2.00pm: Benburb biomass CHP & Heat Recovery
Benburb. Contact Dr P Waterfield, tel: 01232 364090 email: p.waterfield@ulst.ac.uk for more details

OCTOBER 1998

NORTHERN IRELAND
(Date to be confirmed)
University of Ulster
Jordanstown
Joint paper with Phoenix

MIDLAND
Thursday, 1 October
(Venue to be confirmed)
"Energy and its future"- Don Lack , Energy Manager, Leicester City Council.
Contact Mr H Freeman, tel: 0121 353 2397

NOVEMBER 1998

MIDLAND
Thursday 5 November
(provisional venue Austin Court, jointly with IEE)
"Liberalisation of Electricity Sales - Progress to Date" - Glyn Jones , General Manager, Powerline.
Contact Mr H Freeman, tel: 0121 353 2397

NORTHERN IRELAND
(Date to be confirmed)
University of Ulster
Jordanstown. Committee Meeting and Student Meeting.
Contact Dr P Waterfield, tel:01232 364090 email: p.waterfield@ulst.ac.uk

DECEMBER 1998

MIDLAND
Thursday 3 December
(Venue to be confirmed)
"Energy Savings from Compressed Air Systems" - Eric Harding from Air Technology Ltd.
Contact Mr H Freeman, tel: 0121 353 2397

Yearbook 1999

You will see from the back cover that the Yearbook is on its way. It is due to be published in January 1999 in association with Energy in Buildings and Industry. As a member of the Institute you will receive your copy free of charge, but if you are a subscriber you may want to take advantage of the early bird discount of 30% off the £95 (UK retail price). Contact Julie Waite, on fax: 01732 464454.

You may also wish to take advantage of promotional opportunities in the Yearbook, either by placing an advertisement or by listing your company in the directory. Contact Michael Bye on fax: 01732 464454 and promote your company or services the easy way!

There's only ONE YEARBOOK and it only happens ONCE A YEAR

From mining heartland to

Steve Turner Immediate Past Chairman, Yorkshire Branch

A Yorkshire Branch visit - Steve Turner outside the National Coal Mining Museum

The Yorkshire Branch of the Institute of Energy reflects that sturdy independence which characterises the inhabitants of Yorkshire in being the only Branch taking its name from and covering a single county ('Humberside' is no more). The Branch is, however, not as exclusive as the County cricket team, and its 285 members come from many origins and backgrounds.

The history of the region is a history of Energy. This was a heartland of coal mining. On that coal ran the chain of power stations: Leeds - Skelton Grange, Ferrybridge A, B and C, Eggborough, Drax, and Thorpe Marsh, producing nearly 10,000 MW of electricity. In the heart of the mining area, at Grimethorpe, the Pressurised Fluidised Bed test facility was set up as an international venture in the late 1970s. The aim was the development of coal technology to reduce dependence on imported oil. It was the biggest and most technically advanced rig of its time, subsequently used by British Coal in the late 1980s to develop their Air Blown Gasification Cycle (Topping Cycle gasifier).

Oil and gas terminals were established off the coast. Firms developing, testing and supplying combustion and energy equipment operated combustion test rigs and other development facilities in the region. Many successful developments from within the area continue to benefit the nation to this day.

That is how it was. The decline in the coal industry has been dramatic (in more ways than one with the success of films like 'Brassed Off' and 'The Full Monty'). It is significant that the National *Museum* for the mining industry also lies in the Branch area. Of the power stations, only Ferrybridge C, Eggborough and Drax are still operating. Heavy industry, epitomised by Sheffield steel, has also declined in a way that only those who have seen the resulting dereliction can fully appreciate.

There would have been every reason for the Yorkshire Branch to go the same way. Few employers now encourage members to attend meetings or pay their Institute subscriptions, as was once common. Cost-conscious firms must justify expenditure on the support of professional bodies. The public utilities, often generous in their support, are no more. It is not surprising that some of our senior members, who served the country invaluably in times of peace and war, deplore the modern trends and feel that it was better when we had more clout and fewer computers!

The Yorkshire Branch committee however takes its inspiration from the doggedness of the true 'tyke'. For the truth is that Yorkshire continues to be an important centre of energy production. Large coal-fired power stations continue to supply a significant fraction of the nation's energy needs, and if the new high efficiency, low pollution combined cycle gas turbine stations at Killingholme, Brigg and Keadby are technically outside our area, we feel a strong proprietary interest in them and have made them the venues of site visits.

Other forms of energy generation which have been inspected on recent site visits have been windpower at one of Yorkshire Windpower's two local sites, and waste incineration at the Fibrogen plant near Scunthorpe, where chicken litter is direct fired. Arbre Energy, a Yorkshire Water subsidiary, operates a prototype renewable coppicing plant which been the subject of another presentation. CHP generation is becoming common in local industry, and visits are made regularly to keep members abreast of the latest technology.

In a new and harsher industrial climate the region is

modern powerhouse

employing a very wide range of different energy generating strategies. The Branch, too, is employing different strategies, widening the range of its meeting subjects, and looking, where possible, to hold joint meetings with other professional bodies having parallel interests. A joint meeting with the IChemE on integrated pollution prevention and control given by the Regional Environmental Protection Manager of the Environment Agency is a case in point. The good-sized audience was brought right up-to-date with the Agency's current thinking and practice. On a different topic, but with the same approach, a joint meeting with two Branches of the IChemE and local energy managers on the post-Kyoto UK energy scene, with Professor John Chesshire as speaker, is planned for the 1998-99 programme.

Though the Branch programme is essentially technical, social activities are integrated into it wherever possible. The wind farm visit was followed by supper at a local hotel; the AGM was preceded by a lunch for retired members; and the session closed with a family visit to the magnificent Royal Armouries Museum in Leeds.

The Branch is represented on the local Professional Engineering Institutions committee and seeks to play an active part, while remaining to be convinced of the PEI's effectiveness.

The Branch is most fortunate in its academic resources. In Leeds we have the only UK university department bearing the title 'Fuel and Energy'. Here a wide range of undergraduate and postgraduate courses is offered, from Fuel and Combustion Science/Energy Engineering through Environmental Science to Fire Science/ Engineering. A significant programme of research is maintained, and a Centre in Natural Gas Engineering has recently been set up.

We also have a second energy centre of academic excellence at Sheffield University. The Department of Chemical and Process Engineering has produced many distinguished members of the Institute over the years. The relevant undergraduate course is in Chemical Engineering with Fuel Technology, while the Centre for Energy, Pollution and Waste Management provides courses and carries out research in a wide range of energy and environmental topics. An innovative and internationally relevant MA/MSc in Energy Studies has recently been introduced by the Division of Adult Continuing Education, and has been evaluated by the Institute of Energy.

The active support of these departments at Leeds and Sheffield through their heads of department and other senior staff is invaluable to the work of the Yorkshire Branch. Many others could be named who deserve thanks for their efforts, but two must suffice. Andrew Mallalieu has served the Branch invaluably for many years as Secretary, with time off to be Chairman, and has recently received an Institute Recognition of Services Award. Dr Clive Chamberlain (Fellow), President of Evans Universal, Andrew's employer, has consistently supported the Branch in terms of services and use of premises.

The Branch Committee does not anticipate removing its clothes in public (whether or not they are paid to do so), but does believes that defeatism has no place in the Institute's future, and seeks to serve its members, to interest them and to stimulate their minds. It is encouraged by the evidence of closer links with the staff at Devonshire Street, being delighted to welcome Diane Davey to one of her first Branch meetings, and looks to the future with enthusiasm.

New Members

London & Home Counties

Dr Gary Staunton
FInstE, ETSU
Mr John Mather
MInstE
Shell International
Mr Tony Carroll
AMInstE, RAF Brampton
Ms Mairead O'Flynn
Associate, DHL International (UK) Ltd
Mr Saud Muhsinovic
Graduate, Fulcrum Consulting
Mr Nicholas Anderson
Graduate, Trane (UK) Ltd
Mr Robert Diamond
Student

South

Mr Robert Olding
AMInstE, Bournmouth Borough Council

Scotland

Mr Raymond Flanagan
MInstE, Scottish Airports
Mr Roderick Manson
MInstE
Mr Frasier Syme
AMInstE, WG McDonald Associates
Mr Alain Grangeret
Student
Mr Steven Downie
Student

North West

Mr Mark Jones
MInstE
North Wales Fire Service
Mr Charles Wright
MInstE,
Offerton Fire Station
Mr Michael Hagen
MInstE
'A' Division Fire Station

Northern Ireland

Mr Jonathon Grimshaw
Graduate, Faculty and Intergration Design
Mr R Stuart, M Inst E
Kilroot Power Ltd

Midlands

Mr Kevin Turnball, MInstE
Birmingham Heartlands & Solihull NHS Hospital

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