ENERGY WORLD

The magazine of The Institute of Energy

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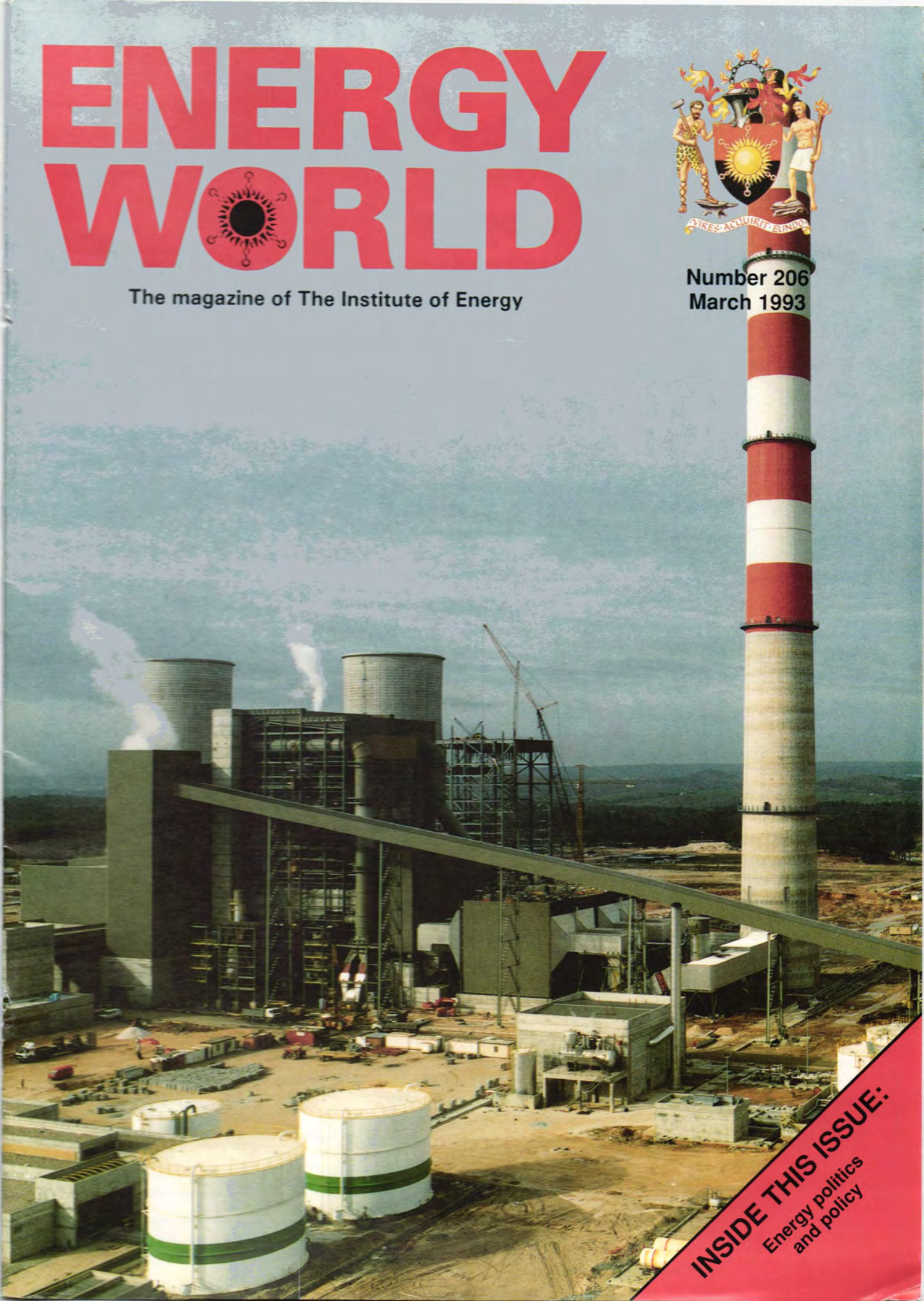

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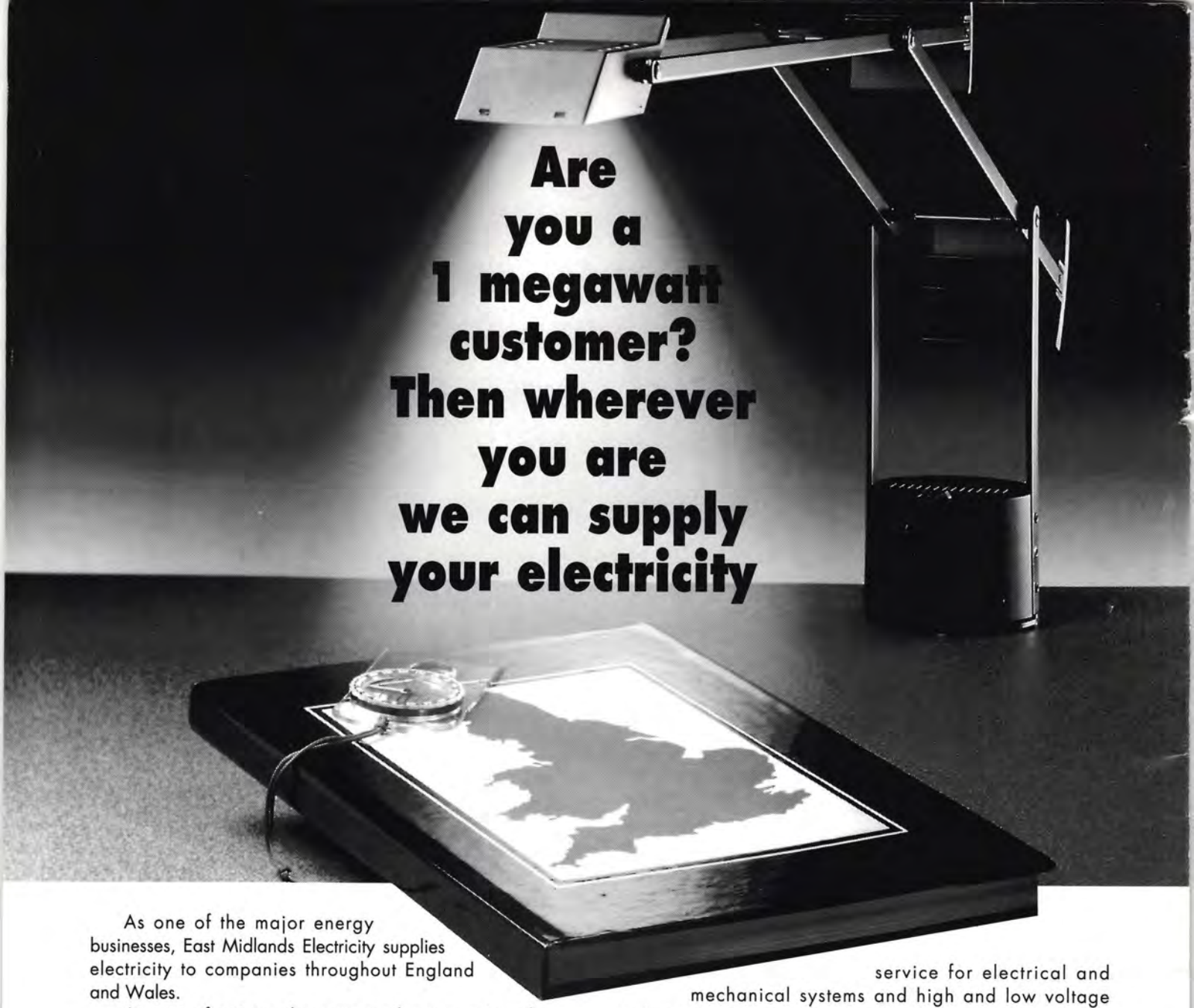

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An unhappy ending

ONCE upon a time, long, long ago — or perhaps it was only yesterday, it is so hard to tell with fairy stories — there was a beautiful village filled with beautiful people. In this village was a shop and the shop was a sugar shop.*

Now this shop had been established since time immemorial — or perhaps even longer — and it was difficult to imagine the village without its old traditional sugar store. The shop keeper was the very heart and soul of village life. Not that he was always easy to get on with, mind you — far from it! He was always threatening to take time off and stop selling sugar, but everyone had a warm place in their hearts for him really. They could all picture him coming up from the cellar where he kept the sugar, and they knew that there was plenty of sugar down there.

But you must not think, gentle reader, that the shop keeper was entirely old fashioned. He studied and did a careful market survey which showed that the village could support two sugar shops. So he went ahead and built a nice clean new one. It cost quite a bit, of course, but everybody in the village was very happy.

At this point, the villain of the piece enters. *(Hiss! Boo!!)* Johnny Come Lately saw that this beautiful new shop had been built as well as the old established one and he had an idea. He knew where he could get a lorry load of sugar and he thought that he would build a cheap, modern, prefabricated shop to sell it from.

Wise heads in the village advised against this. There would be a 50% surplus of shop capacity and there was only a limited amount of new sugar in the lorry, which would run out quite soon. It could only end in tears, they said, and somebody should do something about it, although it was not clear exactly what. Johnny Come Lately wouldn't listen. *(More hisses! More boos!!)* He built his new shop — *(Cries of "Oooh!")* — and it didn't take him very long, either. Before you could say the magic word "NOFFO", he had done it.

Here was a fine how-do-you-do. The wise heads had done nothing and now it was all too late. Obviously, with so much surplus capacity, one of the shops had to close. To add insult to injury, Johnny Come Lately was even talking about opening another shop. They said he wouldn't dare, that he couldn't find any more cheap sugar, that his supply would run out even more quickly and that another shop could never pay for itself. But he didn't care and it was his money, not theirs, wasn't it? So the question left was: which shop would have to close?

Not Johnny's brand new shop, that's for sure. The bank next door had lent him the money for it and he had to prove to them beyond a shadow of a doubt that his was the cheapest shop of all, which sold the cheapest sugar and gave the most efficient service. The bank didn't mind how soon his sugar ran out as long as they got their money back and more. And, as a matter of fact, they really preferred not to lend their money for very long, anyway.

The villagers, too, found that this new source of supply was very nice. It was one of the cleanest sorts of sugar they had ever come across, as well as one of the cheapest. It was much nicer than the dirty stuff sold by the old traditional shop, which had always let them down when it came to the Cleanest Village Contest. The sugar from shop number two was quite clean and cheap as well, as it should have been when the shop cost so much to build, so that had to stay. It was obvious which one would have to go and everybody looked to the place where it had all started.

When they saw what had happened, they were aghast! "Oh no!" they cried, "Not that!" They felt that the village would never be the same again if they shut down the old original shop. "It's not fair!" sobbed the old shop keeper — and everyone in the village agreed. "It's not right!" they said. They could not bear the thought of losing their oldest supplier. So what happened next? Well, of course this was where they needed a Fairy Godmother, and so she appeared, as she always does. *(Cries of "Aaah!" and "Thank goodness!").*

But although this is a fairy story, I can only stretch credulity just so far. The wise heads turned out to be right — it did come to tears: everybody wept. In fact they wrung their hands as well, they were so sad about it. But they could not change the situation. It was still inevitable that one shop had to close, and it was still perfectly clear, as it had been all along, which one it would have to be, fairy story or not. No one in the village was prepared to pay extra for dirty sugar for any longer than they had to. And nobody could make them. It was their money, wasn't it?

All the Fairy Godmother could do was to wave her wand and take her collecting box around the village for donations. It might be possible to support the shop keeper on charity for a few more days but nothing further than that was realistic. And something had to be done pretty quickly, because there was nowhere to put the dirty sugar — everybody's cupboards were already full with 19 months' supply.

"But we want a happy ending," you cry, as a caring reader of *Energy World*. Well, so do I — but I'm only telling the story! What *must* be, will be. There is only one possible ending and our best chance for that to be a happy one is for our old sugar seller to get out of his sugar cellar, and take a tip from the Ironmongers. They went through all the same difficulties not so very long ago and they seem to be living fairly happily ever after.

But I do think perhaps we ought to put a few more pennies into the Fairy Godmother's collecting box, just to be on the safe side.

Donald T Swift-Hook PhD MA MSc FIMA FInstE CPhys FInstP CEng FIEE

*Footnote: The well-informed reader of *Energy World* will instantly recognise that sugar is a carbohydrate with only a moderate calorific value — but this is a fairy story, so we need not bother ourselves with the relevance of such technicalities.

Agreement on James Bay projects

THE CREE Indians of Quebec signed an agreement in January covering various projects being carried out at James Bay, which forms part of their territories.

The accord includes two power stations, Laforge 1 and 2, located 480 km inland from James Bay. The plant will have a joint installed capacity of 1200 MW, and should be commissioned before the end of the century.

The agreement provides for financial compensation, remedial works and other measures intended to allow Crees who wish to do so to pursue their traditional activities.

The financial compensation amounts to a total of $50 million, $15 million of which will be paid in cash to community funds, with the remaining $35 million being paid in 50 annual installments. In addition Hydro-Quebec has undertaken to advance up to $15 million for repairs to the sewage system in the Cree village of Chisasibi.

A further $25 million will be used to carry out remedial works, administered by joint venture company called Opimiscow Companee or SOTRAC '92, which will be run by a committee of three Cree and three Hydro-Quebec representatives.

National Power launches new international business division

THE UK's largest electricity generating company, National Power plc, launched a new international business division in February.

National Power International (NPI) has been set up on the strength of its experience of operating abroad from the consultancy operations formerly undertaken by British Electricity International (BEI).

The new division is actively pursuing investment and acquisition opportunities in more than 15 countries in Australasia, Asia and the Far East, North America and Europe.

Among NPI's current investments are the Pego project, Portugal, Hub River in Pakistan and the Paka and Pasir Gudang project in Malaysia.

The role of NPI varies from project to project. In Portugal NPI is the lead investor, joint operator and fuel supplier to the Pego scheme, which consists of two 300 MW coal-fired stations to be commissioned in 1993 with an option on two further units later in the decade. Whereas at Hub River, NPI is part owner and operator of a new four unit 300 MW oil-fired plant, due for commissioning in 1996.

Recent projects include Castle Peak 'A' and 'B' in Hong Kong for China Light and Power, and Hwange in Zimbabwe for Zimbabwe Electricity Supply Authority.

Cuba's 1st licensing round

SEVENTY representatives from over 40 countries attended presentations in London in February outlining procedures for Cuba's first international licensing round.

This first round is part of Cuba's new policy to attract foreign investment in petroleum, and represents the first opportunity for participation by international companies in 30 years.

Seven onshore, one on/offshore and three offshore blocks of new exploration acreage are offered in the first round.

Foreign investment in Cuba's oil industry began in 1989, and currently four non-Cuban companies have exploration contracts.

The London presentations, along with those made in Calgary, also in February, were organised by Simon Petroleum Technology on behalf of Comercial Cupet. Simon Petroleum Technology have organised similar licensing rounds for Peru and Poland.

UN picks Perth

THE WORLD'S first international solar science centre is to be built in Perth, Western Australia.

The A$30 million project will go ahead at Murdoch University, and will be one of several similar centres in areas of high solar radiation, such as the Indian subcontinent and North Africa.

Head of the 14-member United Nation's team, and chief of new technologies at the UN Industrial Development Organisation (UNIDO), Anthony Bromley said that the UN Centre for Applications of Solar Energy would give a boost to the world solar energy industry by commercialising and marketing renewable energy projects in developing countries.

The UN team has indicated that the centre could receive international funds to support research valued at more than A$9 million over its first three years.

In the initial stages, the centre will concentrate on a detailed assessment of the energy needs of the Asia-Pacific region, and how best to organise the transfer of solar energy technology.

UNIDO will finance the construction of the centre on a 500sq metre site at Murdoch University. Australian state and federal governments will contribute A$1 million per annum for three years.

Pictured above left is an artist's impression of what will be the world's largest combined cycle gas turbine (CCGT) power station. The 2400 MW plant will be built at Black Point (above right), on the north-western side of the New Territories of Hong Kong. Mouchel Asia Ltd, the Hong Kong subsidiary of UK engineering consultants, Mouchel, will provide full consultancy services, including planning, civil engineering and environmental risk assessment for the £1800 million natural gas power station.

Early Day Motion for Green Party Energy Conservation Bill

AN all-Party Parliamentary initiative on energy conservation was launched on 24 February.

The Energy Conservation Bill was introduced by Plaid Cymru MP, Cynog Dafis MP, and drafted by the Green Party. Also promoting the Bill are Conservative MP, Sir Richard Body, and Labour's Clive Soley.

An Early Day Motion has been tabled in support of the Bill, which requires district and borough councils to draw up energy conservation plans to achieve savings of up to 30%. Plans will be assessed in terms of energy saved, reduction in fuel bills and jobs created.

The Bill has the support of the Association for the Conservation of Energy, and a Green Party spokesperson, Jean Lambert, said: "There can be no reason for any MP not to support this Bill. The advantages are so manifest."

During (above) and after (below) the successful laying of a 12 inch diameter natural gas pipeline under the estuary of the River Duddon in Cumbria, without disturbing the ecological balance of the site.

British Gas used a directional drilling technique specially developed for this purpose, and used in Britain for the first time. The pipeline was installed in a series of shallow loops drilled from only one small platform on the river.

Duddon Estuary is home to a wide range of wading birds and wildfowl, and is designated a Special Protection Area under an EC directive, as well as being a site of Special Scientific Interest.

OFGAS calls for gas split

GAS industry regulator OFGAS has outlined radical changes to the structure of the gas market in a document, published on 1 March, based on evidence submitted to the Monopolies and Mergers Commission.

Director General of Gas Supply, Sir James McKinnon described British Gas (BG) as not one monopoly, but three: monopoly purchaser of gas and largest single owner of offshore gas fields; ownership and control of pipeline and storage systems; and in addition it has the monopoly right to supply over 98% of gas customers.

OFGAS have put forward two key suggestions. The first borrows much from the privatisation of the ESI, with the establishment of 12 independently owned and controlled regional gas supply companies. It is also suggested that BG's gas purchasing business be hived off into a separate company along with its offshore fields.

Robert Evans, Chairman of BG, described the proposals as "a smash and grab raid", adding that the proposed changes could cost in the region of £3000 m over the next decade, and someone would have to pay that price.

No go for oil-seed rape

A DTI report published in February has concluded that bio-diesel derived from oil-seed rape is one of the least economically attractive renewable sources of energy. A subsidy of approximately 15 pence a litre would be required for the fuel to become economically viable for transport purposes in the UK.

The review, prepared for the DTI by the Energy Technology Support Unit, also considers the environmental implications of bio-diesel production and use.

A Review of the Potential of Bio-diesel as a Transport Fuel is available from Her Majesty's Stationary Office, price £8.50.

Labelling is key to efficiency

IN a proposed amendment to Building Regulations the Government requires energy labels be provided with all new homes.

The National Energy Foundation (NEF) estimate the proposed package will raise the energy efficiency of an average new home by 25-35%, with an increased construction cost of only 1-2%.

Economic purchasing review

A FURTHER statement to OFFERS's Review of Economic Purchasing of December last year, was published in February.

Director General of Electricity Supply, Stephen Littlechild, found that none of the RECs had exceeded their 15% maximum own generation limits.

Professor Littlechild also noted in his statement that the state of affairs between the RECs and the major generators was unsatisfactory, with a considerable lack of 'meeting of minds'.

"The RECs' concern about diversity of supply is valid" said Professor Littlechild, "The options presently open to RECs wishing to diversify their supply are extremely limited. He went on to say that concern had been expressed that new CCGT plant may be more costly than existing coal-fired stations, but this may be due to an over-pricing of electricity from coal-fired plant."I have asked National Power and PowerGen for further details of their costs and shall be examining the costs and margins on their licensed businesses generally." he said "In view of the importance of prices, profits and competition in the generation market, I shall monitor the situation particularly closely."

The statement also reveals that consideration is being given to changing the present form of supply price control to one which would provide a sharper incentive for companies to contract for electricity economically.

CFBC, USA

A CIRCULATING fluidised bed boiler for a 180 MW coal-fired plant, known as the Warrior Run Cogeneration Project, will be supplied by ABB Combustion Engineering Systems, based in Connecticut, USA.

ABB's Steam Turbine Division, in Virginia, will provide the steam turbine generator set, and ABB Environmental Systems of Alabama, the air quality control system.

The plant will be built on a 67-acre site near Cumberland in Maryland, and is expected to be completed in late 1996.

The weather, at your service

The new London Weather Centre, at 127 Clerkenwell Road was officially opened in January by Lord Sainsbury.

The Met Office's new flagship facility will serve the public and industry in eight countries. "The move follows a new demand for specialised services from industry and commerce" said Bernard Herdan, Met Office Commercial Director.

They currently provide British Gas, National Grid Control, British Coal, the RECs and the power generators with a range of meteorological services, including warning services, climatological studies and short and medium-term forecasts.

Understanding

A MEMORANDUM of Understanding has been reached between BP and Honeywell.

The understanding is an "expression of a relationship that exists between the companies, and ensures that Honeywell technology delivers demonstrable benefits to BP's plant assets" said Malcolm Young, Honeywell's account manager for BP.

For almost 20 years Honeywell has worked with BP to reduce its processing costs in its oil refineries and chemical plants, as well as helping BP in its exploration operations. The long-standing relationship makes upgrading more affordable.

A forest that means business

OVER 194 square miles of land within the counties of Derbyshire, Staffordshire and Leicestershire are being used to create a National Forest.

A National Forest Development Team is increasingly working with companies which find that practical forest projects are not only good for business, but find favour with employees.

In association with East Midlands Electricity, the National Forest Team has produced a leaflet suggesting ways for companies to help shape the forest whilst demonstrating their environmental concern, and projecting themselves as a 'green' company.

Those companies interested in learning more about the project should contact: Caron Thompson, The National Forest Development Team, Stanleigh House, Chapel Street, Donisthorpe, Swadlincote, Derbyshire DE12 7PS.

Let the sun-shine in

THE LATEST Solar Technology Catalogue is now available, priced £5.00, which includes copies of Solar Products International's quarterly newsletter.

The current issue includes an article on the Swiss government and private sector solar demonstration projects, aimed at producing around 50 MW of peaking power by the year 2000.

The catalogue contains sections on a wide range of solar powered products: from garden lights and fountains, to hi-fi equipment, clocks and watches, batteries and chargers, cells and panels, as well as a section on publications and another on consultancy services

For copies of the Solar Technology Catalogue, write to Solar Products International Ltd, P O Box 438, Harrow, Middlesex HA2 9UT. Tel: 081 868 8353; fax: 081 429 4270.

Packaged air conditioning

A REPORT published recently by the Building Services Research and Information Association (BSRIA) values the packaged air conditioning market in 1991 at £146 m.

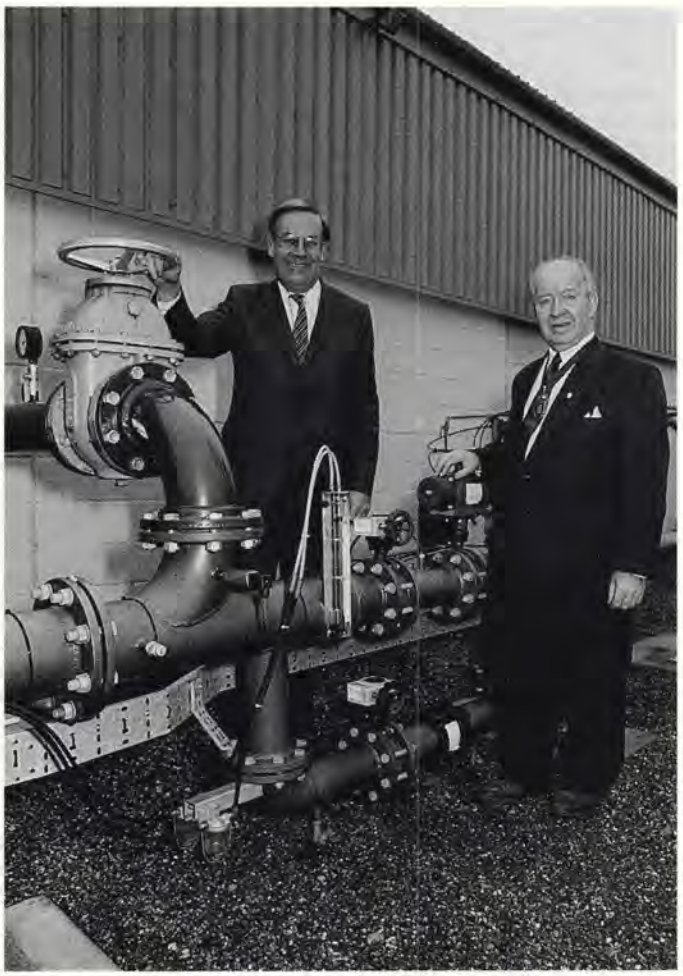
This figures represents sales of around 90 000 units, but marks the market's first year of decline after almost a decade of steady growth.

Most of the growth can be accounted for by the split systems sector, which has increased five fold since 1985. Sales of small self-contained units halved in volume terms during the same period.

The close control sector has been subject to two distinct influences: downward pressure as a result of the decline in units used for computer room appliances, and an increase resulting from their growing use in industrial clean room applications. As a result the market remained fairly stable during the 1980s, although it has experienced a down turn in the early 90s.

The portable market has continued to grow at 10% by volume per annum, although since 1989 new entrants into the market have meant downward price pressure, so the value of the market has remained the same in real terms.

BSRIA expects the market to continue to fall by 20% in 1993.



East Midlands Electricity's first generating plant using landfill gas was opened at the end of last year by the leader of Warwickshire County Council, Cllr F G Watson (pictured above right). Left is Philip Champ, a director of East Midlands Electricity.

The site at Ryton on Dunsmore, near Coventry, will produce enough electricity to meet the domestic needs of around 1000 EME customers, and was made possible by the cooperation between EME and Warwickshire County Council, who own the landfill site.

The future of British coal

*by Dr Michael Clark FKC, FRSC, MP**

Following the recent publication of the Department of Trade and Industry's Select Committee on the market for UK coal, the chairman of the now defunct Select Committee on Energy, Dr Michael Clark MP, outlines his thoughts on the way forward for the coal industry in this country.

ONLY the unexpected can be expected in politics. That our indigenous coal was over-priced compared with available imports was well known; the environmental problems of coal had long been established; competition from other fuels was each year more severe, and coal at the end of a privatisation chain was acknowledged to be disadvantaged, the Cinderella of the energy world. Despite all this the proposed pit closures took the country by surprise.

Perhaps the Government should have remembered last October that as Christmas approaches the audience always sides with Cinderella, particularly when its cold outside; and at the end of the show the glass slipper always fits, although one suspects it sometimes has to be tailor made.

It matters not whether the slipper comes from a Prince Charming or a Select Committee, the fact is the audience is demanding a happy ending. Can this be achieved without disturbing other members of the cast, or asking the audience to pay an increased admission price? In this article I would like to try to show that it can.

In my opinion we have not had an energy strategy in the UK for 20 years. By that I mean that no attempt has been made to look into the future to consider our reserves and our demand, to estimate home production costs and compare them with world market prices, to calculate the effect of energy prices on manufacturing industries or to determine the discounted value of energy exports.

We have of course had policies. The most prominent of which has been based on the twin pillars of market forces and diversification. Both features are admirable in their own way, and they are capable of working well in harness together, provided there are checks and balances, without which the former will destroy the latter.

This island of ours grew prosperous in the eighteenth and nineteenth centuries with coal as our only natural resource, it is ironic that now, in the latter half of the twentieth century — blessed with energy resources hitherto undreamed of — we should consider abandoning coal for illusory short-term gain at home, while giving long- term advantage to those who export to this country. The time has arrived when we must move from a *laissez-faire* energy policy to a long-term national energy strategy. The pit closure debacle may at last have forced it.

*Conservative MP for Rochford and Rayleigh

The threat to coal

Coal, of all our indigenous energy sources, has the most problems. That is why at a time of cheap prices and international excess it is most threatened.

With current British Coal prices, imports pose the greatest threat. Even if British Coal achieves its intended reduction in pithead price in 1993-94 from the present £1.86 per GJ to £1.51 per GJ, a significant premium over import prices would remain, disappearing only in 1997-98 when the price falls to £1.33 per GJ.

Other fuels have taken some of coal's share of the generating market. Gas alone through the rapid introduction of CCGT stations is likely to have 25% of the total market by 1995/96, while nuclear energy has raised its share by nearly 1% per annum over the last three years to 19.1% at present.

Electricity imports from France, which increased by 26% between 1989 and 1992 now displace 6.5 m tonnes of coal. Imported coal, gas-fired stations and French electricity all operate on base load — a favoured and profitable mode.

One of coal's biggest problems is excessive stocks resulting from unexpected low electricity demand, high nuclear output and the pre-privatisation stocking policy. Currently the two main generators hold 35 m tonnes and British Coal 14 m tonnes. Each wish to reduce their stocks in order to free capital; until the generators can do so they are unlikely to agree to new coal purchasing contracts. However, if coal is to survive as a major British industry, and if the pit closure programme has any chance of being reversed, measures must be taken to regain British Coal's share of the coal market, and to retain coal's share of the generating market.

It is generally agreed that an additional 15 million tonnes of British coal could be accommodated by the electricity supply industry — even without changing the projected share of other fuels. It is important that this proviso be constantly borne in mind as there is little point in finding an extra market for one indigenous fuel — and possibly a subsidised one at that — if it displaces another indigenous fuel that may well be competitive and profitable.

While British coal remains dearer than imported coal there will be a cost associated with import displacement and a mechanism to secure the additional sales will need to be developed. One way of calculating the cost would be from the generators estimate that British coal could only displace imported coal for power generation if in 1993-94 its delivered price were £5 per tonne cheaper, and its 1997-98 delivered price £0.75 per tonne down. There are however many variables including uniformity of pithead prices, responsive import prices, import cost improvements and the price of oil.

The Select Committee, after much public evidence taking and private deliberation, decided to recommend that the Government provide a subsidy to the generators to burn up to 16 million tonnes of British coal over and above the quantities of 40 m tonnes falling to 30 m tonnes for which they are expected to contract in 1993-98, and that the subsidy be equal to the difference between the delivered costs of the additional British coal and the imported coal.

In order that British Coal should have a spur to encourage them to attain their self-

imposed cost targets, the subsidy should be until 1998 only, and conditional on achievement of specified reductions in operating costs. The cost of the subsidy is likely to be more than the £5 per tonne referred to above, to which inland delivery costs must be added, and closer to the £15 per tonne (or thereabouts) differential between British and imported coal prices. In any event the total cost of displacing 15 m tonnes of imported coal should be less than £200 m in 1993-94 and in subsequent years would decline sharply; £70 m in 1995-96 and little over £50 m in 1997-98. The total cost, unlikely to exceed £500 m over the five years to 1998, could be off set against the £1.3 billion public sector borrowing requirement (PSBR) provision in 1993-94 for closing all 31 pits as less than half that expenditure would be necessary providing 15-16 pits survive.

Action to retain coal's share

Some measures considered by the Select Committee were quickly rejected — the closing of nuclear power stations and the mothballing of Sizewell B. Others such as a dramatic reduction in imports from France (and the prompt removal of veiled subsidies hitherto unrevealed), and the prevention of the use of orimulsion and high-sulphur heavy fuel oils without flue gas desulphurisation were unanimously agreed. As was the need to restore a realistic merit order based on costs to replace the much-discredited pool mechanism.

It is not realistic to think that coal can be sufficiently attractive to discourage the building of more CCGTs. It is however to be hoped that as part of the current energy review, future section 36 consent will favour projects not promoted by either of the two main generators, who would then have an incentive to operate existing plant (often coal-fired) more efficiently, and offer better contracts to the RECs.

Any plan to reduce the volume of efficiently mined open-cast coal would adversely affect coal's market share of the power generation market, or at best it would assist imports to shore-up coal's share with no benefit to the British economy or the indigenous coal industry.

The whole purpose of the Select Committee enquiry was to prevent the UK losing a valuable fuel resource, to save jobs, and by preventing imports, to assist the balance of payments. To these ends a transitory and declining subsidy for British Coal was suggested, along with the removal of the subsidy on electricity supplied from France. Further, it is proposed that EdF's ability to negotiate contracts to supply baseload electricity from 1993 should be conditional on UK generators having direct access to the French electricity market through the French grid to the networks of other countries.

Finally, a major conclusion that should not be forgotten. As was mentioned at the commencement of this article, coal suffers because when it is burnt in power stations, it has adverse environmental consequences, both in terms of sulphur dioxide and carbon dioxide. This, coupled with the relatively low combustion efficiency of traditional coal-fired stations and the consequent high price of electricity generated, puts coal at a considerable disadvantage compared to gas in particular.

Flue gas desulphurisation (FGD) while largely eliminating sulphur dioxide pollution does nothing to ameliorate carbon dioxide emissions or improve efficiency or costs — in fact quite the contrary on all three counts. This is the reason why we should be investing not in FGD, but in clean burn coal technology in which we had until recently the technological lead. Clean coal technology — and there are many differing techniques — removes sulphur during or immediately after combustion, and by introducing combined cycles, significantly increases the thermal efficiency of the generating station.

The consequence of this is no sulphur dioxide, less carbon dioxide per unit of electricity, and cheaper power. Surely we should be investing venture capital in technology of this sort rather than finding funds for redundancy payments. After all, coal is still the most widely used fuel throughout the world for power generation, and many countries will be keen to buy proven clean coal technology over the next few years — but only from countries with demonstration plant.

Whether it is called pump priming, national investment or subsidy, the fact is Cinderella needs a little more care for a little longer in order that her full potential can be realised. It would be reprehensible to with hold assistance now — its nearly midnight.❑

The author

Conservative MP for Rochford and Rayleigh, Dr Michael Clark was born in the coal mining area of Nottingham.

He obtained a first class Honours degree at London University, and a PhD from Cambridge before joining ICI as a research scientist.

Dr Clark first stood for Parliament in 1979 as Conservative candidate for Ilkeston in Derbyshire, but was not successful until 1983, when he stood for the Rochford constituency in Essex.

His Parliamentary activities have revolved around science and technology issues. He was Vice-Chairman of the Conservative back bench Energy Committee, Secretary of the Parliamentary and Scientific Committee, founding Treasurer of the Parliamentary Office of Science and Technology and Vice-Chairman of the all-Party Group for Energy Studies.

A Companion of the Institute of Energy, Dr Clark is a Fellow of King's College, London and a Fellow of the Royal Society of Chemistry.

European Energy Charter — a progress review

*by John R Byrne**

In April last year, *Energy World* carried an article on the European Energy Charter. The Charter had been signed in December 1991 by the EC and OECD states, Japan, America and most of the Republics of the former Soviet Union. The 'Basic Agreement', the legal document implementing the Charter, was expected to be in place by mid 1992, but its drafting and negotiation has proved more problematic than originally anticipated. This article reviews the progress made during the last year towards the Charter's implementation and the content of the Draft Basic Agreement.

THE EUROPEAN Energy Charter aims both to liberalise the energy trade between signatories, and to ensure sufficient protection for investment made in energy projects.

The original 45 signatories were Albania, Armenia, Australia, Austria, Azerbaijan, Belgian, Byelorussia, Bulgaria, Canada, Czechoslovakia, Cyprus, Denmark, the European Communities, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, the Interstate Economic Committee, Ireland, Italy, Japan, Kazakhstan, Norway, Poland, Portugal, Romania, the Russian Federation, Spain, Sweden, Switzerland, Tadjikistan, Turkey, Ukraine, the United States of America, Uzbekistan and Yugoslavia. Moldavia and Kirghizstan signed in February 1992, and subsequently Lithuania, Estonia and Slovania have all become signatories to the Charter. Turkmenistan is the only Republic of the former USSR not to have signed the Charter. At one stage New Zealand was also to have been a signatory to the Charter, but it decided it was too peripheral and withdrew from the negotiations.

Work continued throughout 1992 to complete the Basic Agreement and to transform the Charter from a statement of politicians' intentions to a legally binding international agreement.

To facilitate the implementation of the Charter, a Secretariat has been established. Based in Brussels, the role of this body is to provide the necessary administrative support to assist in the negotiation of the Basic Agreement and the implementation of the Charter. For example, it oversees the translation and circulation of revised drafts to the Basic Agreement and provides such support services as are necessary. In addition it disseminates information on the Charter through the publication of articles and the holding of seminars (in Moscow and elsewhere) intended to clarify issues and increase understanding of the aims of the Charter. The Secretariat currently has a staff of about ten, and in addition it utilises personnel in other agencies (such as the Commission) where necessary (eg, for translation services).

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The Basic Agreement

Whereas the Charter is no more than a statement of political intent, the Basic Agreement implementing the Charter will be a legally binding agreement. The working group preparing the Basic Agreement is chaired by a representative from the UK. It was hoped that the Agreement would be signed in Lisbon in late June of last year. However a first draft was withdrawn following strong criticism (it was felt to be too technical and too ambitious), and a completely revised draft was circulated in February 1992.

This has subsequently been negotiated at length. Progress made in the negotiation of the Agreement has been slow, which is due in no small part to the fact that not all the parties are in agreement as to how the fundamental provisions of the Charter should be implemented, nor as to the inter-relationship between the various objectives of the Charter.

The negotiations are extremely complex. Some have described the Agreement as one of the most complex treaties ever negotiated. The draftsmen are being charged with the negotiation of a multi-lateral treaty with various objectives which must also be consistent with other bi-lateral treaties, entered into by nearly 50 signatories, as well as being consistent with obligations of existing multi-lateral treaties, such as GATT, the Treaty of Paris (establishing the European Coal and Steel Community) and the Treaty of Rome.

35 drafts of the Agreement have been circulated so far of which approximately seven contained major revisions. As negotiations progress, the need for major rewriting of the draft Agreement has lessened (between drafts 15 and 35 there was only one substantive redrafting exercise). The latest draft (now receiving limited circulation) was released on 9 February 1993. Despite delays, good progress seems to have been made, and negotiation of the Basic Agreement is currently taking up about a week per month. However, it is hoped that the Agreement, together with the first three protocols will be ready by the end of May.

Content of the draft Agreement can be divided into administrative and constitutional provisions, and those which are more substantive in nature. This review of these provisions is intended to give a flavour of the contents of the Agreement, and doesn't purport to be a comprehensive legal analysis. For ease of reference, future contracting parties to the Agreement will be referred to as 'signatories'.

Substantive provisions

The philosophy behind the Charter and the Agreement is that increased demand for energy in Europe will be met mainly from increased oil, natural gas and coal production in Eastern Europe and the CIS. The assumption being that this increased production will

be encouraged and financed largely by Western investment. Accordingly, it is considered essential that the Agreement contains adequate investor guarantees of a legal nature, covering protection of investments, repatriation of profit and commercial dispute resolutions.

Whereas the Charter spoke of 'the access to and development of energy resources', the Basic Agreement focuses on energy materials and products. It covers everything from nuclear energy to coal, natural gas, petroleum, petroleum products, electrical energy, renewable energy and various hydrocarbons.

Article Four acknowledges State sovereignty, and sovereign rights over energy resources and in particular the fact that the State holds the right to decide the geographical areas within its domain which shall be made available for exploration and development.

Each signatory undertakes to facilitate access to, and development of, energy resources. This will be done by the formation of transparent rules regarding the acquisition, exploration and development of energy resources. The rules are to be applied on a non-discriminatory basis in accordance with the provisions of the Agreement and any relevant protocols. The signatories agree to promote access to local export and international markets for the disposal of energy materials and products on commercial terms, and undertake to remove barriers to trade.

Energy materials and products from any signatory are to be given non-discriminatory access to markets in other signatories' territories in accordance with the agreement. Similarly, investors of one signatory are not to be prevented, excluded or restricted from entering and operating in the markets of another signatory. Each signatory agrees to work to alleviate market distortions and barriers to competition. There is an acknowledgement (not yet agreed) that price formulation is to be based on market principles.

The signatories undertake to use their best efforts to apply the provisions of GATT to Government procurement, for both energy materials and products, by Government controlled entities, and to the procurement of works, equipment and services by such entities producing energy materials and products. Going further, each signatory undertakes not to afford protection to domestic products or suppliers when it grants an entity exclusive or special privileges, or to discriminate among foreign production suppliers.

Article Seven provides that each signatory will ensure effective and adequate protection of intellectual property rights, according to the applicable international conventions, with particular reference to the Berne Convention for the Protection of Literary and Artistic Works and the Paris convention for the Protection of Industrial Property. This is one of the provisions which has been significantly simplified during the course of negotiation. Earlier drafts provided for contracting parties to afford protection under domestic law no less favourable than the protection supplied to its own nationals. They went on to provide that where signatories were not parties to the Paris or Berne Conventions, they would provide protection at least equivalent to the minimum required by those Conventions. The redrafted provision clearly goes further than this.

Competition rules

The competition provisions require contracting parties to work to alleviate market distortions and barriers to competition in the extraction, production, conversion, treatment, carriage (including transmission, distribution and marketing), and supply of energy materials in relevant markets, in so far as they may affect trade between contracting parties (conceptually this is similar to the provisions of Article 85 of the Treaty of Rome).

Each signatory accepts an obligation to ensure that within their jurisdiction they have, and enforce, such laws as are necessary and appropriate to prevent unilateral and concerted anti-competitive conduct. This provision is clearly aimed at Eastern Europe — indeed in the latest drafts of the Basic Agreement there is express provision (still subject to negotiation) that where signatories already have such laws, their scope, interpretation and implementation will not be affected by the Basic Agreement.

Signatories with experience in applying competition rules are to give full consideration to providing, upon request, technical assistance on the development and implementation of competition rules to other signatories. Signatories may also cooperate in the enforcement of their competition rules by consultation and exchange of information. Neither of these are mandatory.

Former drafts of the Agreement contained provisions on monopolies, but these have since been deleted. Another now deleted provision required that State aid to energy industries be prohibited if it was granted with the objective of distorting trade competition. It was alternatively proposed that State aid could be allowed if it promoted a more environmentally friendly use of energy resources.

Transportation of energy products

Article 11 relates to the transport and transit of energy materials and products. Each signatory is required to take the necessary measures to facilitate the transit of energy materials and products through its own domain, the domain of another signatory and to that of a third signatory, without distinction as to origin, destination or ownership. Signatories are not allowed to impose any unreasonable delays, restrictions or charges on the transport or transit of such products.

Signatories agree to encourage modernisation of transit supply networks; to encourage the development and operation of transport infrastructure serving the domain of more than one signatory; to encourage measures to mitigate the effect of interruption of supply of energy materials and products; and to encourage inter-connection of high voltage transmission grids.

Each signatory undertakes that its laws relating to transport and use of harbour facilities, high pressure transmission pipelines or high voltage transmission grids, will be no

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less favourable than its laws relating to its own domain (unless otherwise provided for in an existing international agreement). Where a dispute arises over terms and conditions of transit, signatories agree that this will not interrupt the existing flow of energy, materials and products until after it has been referred to the Council for conciliation. There is *not* an absolute prohibition on the interruption of supply. It is recognised that access to existing high pressure transmission pipelines or high voltage transmission grids may not be available due to lack of capacity, in which case signatories accept an obligation not to place obstacles in the way of establishing financially and economically viable new capacity.

It has been pointed out that the Charter expressly states that transits should take place in economic and environmentally sound conditions. Later drafts of the Agreement simply refer (Article 11{4}) to capacity being created subject to the signatories applicable legislation on safety, technical standards, environmental protection and land use. This subtle difference creates a lower standard.

There is provision in the Agreement for the transfer of technology with each signatory agreeing to promote access to, and transfer of, technology on a commercial and non-discriminatory basis so as to assist effective trade and investment, and to implement the objectives of the Charter. Note this is to be "in accordance with existing laws of contracting parties". A sub-article provides that signatories will eliminate existing obstacles to the transfer of technology, and create no new obstacles in the energy field.

Article 13 provides for each signatory to accord to investors of other signatories access to capital markets for the raising of funds, insurance or the sale of equity shares and other securities in connection with the extraction production, conversion treatment, carriage or supply of energy materials or products on no less favourable terms than those accorded in like situations to its own investors. However, it is expressly acknowledged that nothing in the article is intended to impair the ability of financial institutions to establish and apply their own lending criteria based on market principles. Each signatory additionally agrees to provide the fullest possible access to public credits, guarantees and insurance for investors in the extraction, production, conversion, carriage or supply of energy.

Investor protection

One of the key provisions of the Basic Agreement is Article 16. This covers promotion, protection and fair treatment of investment.

Under the provisions of this Article, each signatory is obliged to encourage and create stable, equitable, favourable and transparent conditions for investors from other signatories to make investment in its domain. 'Investment' is very widely defined as meaning every kind of energy asset owned or controlled (directly or indirectly) by investors in one signatory. A list states that investment includes tangible and intangible, moveable and immovable property; shares in, or stock, or other forms of equity bonds or debentures; or debt of any company or business enterprise; claims to money and claims to performance under contracts having economic value; intellectual property; and any right conferred by law relating to an investment (or by virtue of any licence and permits pursuant to the law).

It is expressly provided that change, in the form in which assets are invested, does not affect their character as 'investments'. The term 'investment' is expressly provided to include all investments, whether existing at, or made after, the dates of entry into force of the Agreement, provided, however, that where investments are made before, and continue after, the effective date, the Agreement only applies to matters affecting investments after such date.

The Agreement requires that such investments shall enjoy the most constant protection and security. No contracting party is permitted to impair, by unreasonable or discriminatory measures, either management, maintenance, usage enjoyment or disposal. It is expressly recognised that in no case shall investments be accorded treatment less than is required by international law.

Each signatory is required to permit investors from other signatories to make investments in its domain on the most favourable basis recognised by the State. Some limited exception to this obligation is permitted provided that such exception is contained in the domestic legislation in force at the date of signature of the Agreement and that the relevant laws, regulations and policies are publicly available. Where existing restrictions are in place signatories agree to make every effort to reduce restrictions which affect the ability of investors from other signatories to make investments. The Council is charged with periodically reviewing progress in this direction periodically, the first review to take place no later than 1996.

Article 17 provides for compensation for losses where investors suffer losses owing to any armed conflict, state of national emergency, civil disturbance or other similar event. Where any investor suffers loss in any of these cases resulting from the requisition of their property by the signatories, forces or authorities or the destruction of their property by such persons which is not caused in combat, that the investor shall be accorded restitution or prompt, adequate and effective compensation.

Article 18 provides that investments shall not be nationalised, expropriated or subject to measures having the effect equivalent to nationalisation or expropriation except where expropriation is a) in the public interest; b) not discriminatory; c) carried out under due process of law and d) is accompanied by payment of prompt adequate and effective compensation. Such compensation is to amount to the fair market value of the investment appropriated at the time immediately before the appropriation, impending or otherwise, became known. This is calculated on the basis of the prevailing market rate of exchange from that date and must include interest at a commercial rate, from the date of appropriation to the date of payment. The laws of the signatory making the appropriation must provide a right to prompt review by judicial or other independent, competent authority.

The transfer of payments related to investment is provided for in Article 19. Each signatory accepts an obligation in respect of investments by investors in its domain to guarantee the freedom of transfer into and out of its domain. This includes the initial capital, returns and payments arising out of settlements of disputes, payments under contract, compensation *or assets* where appropriated or lost, proceeds of sale or liquidation, unspent earnings, and renumeration of personnel. Article 19 also provides that any transfer of payments under this Article are to be effected without delay, and made in a freely convertible currency. A provision added later in the drafting provides that transfers will be made at the prevailing market rate of exchange on the date of transfer.

Taxation is covered at Article 20. There is a general exclusion to provide that as except as set out in that Article nothing in the Agreement shall apply to taxation measures of signatories. However, the Article confirms that the provisions relating to a signatory providing Most Favoured Nation Treatment relating to trading goods and services also applies to taxation measures (other than income, capital, estate or inheritance tax). Likewise the provisions on expropriation (Article 18) apply to taxation measures and where such taxation measures are discriminatory there is a dispute settlement mechanism outlined.

With reference to withholding tax, the Article provides that the provision on transfer of payments relating to investment do not limit the right of a contracting party to impose or collect tax by withholding or other means.

Dispute resolution

Article 23 sets out the mechanism for resolving disputes between investors and signatories, while Article 24 sets out the mechanisms for resolving disputes arising between

signatories themselves.

Article 23 provides that disputes between one signatory and an investor shall, if at all possible, be settled amicably within a period of three months. If this is not possible, at the request of the investor concerned, the dispute can be submitted to international arbitration or conciliation.

It is also proposed that where an investor has submitted the dispute to the courts or tribunals of a signatory, or has submitted to dispute resolution in accordance with any previously agreed dispute settlement procedure, the investor will not be entitled to submit the dispute to international arbitration or conciliation.

The Article goes on to provide that where a signatory is, or has become, a member of the convention on the settlement of investment disputes between states, and nationals of other states, then that signatory (by signing the Basic Agreement) consents to submit disputes for settlement under that convention. Where, however, the signatory is not party to that convention, the dispute may, at the choice of the investor, be submitted to the International Centre for Settlement of Investment Disputes, or an international arbitrator established under the arbitration rules of the United Nation Commission on International Trade Law, or an arbitration proceeding under the Institute of Arbitration of Stockholm Chamber of Commerce, or an international arbitrator appointed by special arrangement. By signing the Agreement each signatory gives its unconditional consent to the submission of the dispute to international arbitration in accordance with the provisions of this Article.

The final sub-clause of Article 23 provides that awards of arbitration, which may include interest, are final and binding and shall be enforceable in accordance with domestic law.

Where a dispute arises not with an investor but with another signatory, and concerns the interpretation of the Agreement, Article 24 provides for its settlement to be through diplomatic channels if possible. If it is not possible, and the dispute can be brought under the provisions of a bi-lateral agreement between the signatories, those provisions prevail. Subject to this, if the dispute cannot be settled through diplomatic channels within 180 days, either party can request that it be submitted for dispute resolution to an ad hoc arbitral tribunal. The expenses are to be borne equally between parties, and the award is to be final and binding.

Article 24 also provides that where the disputes is between parties to GATT, they shall settle the dispute in accordance with GATT procedures. This seems to be to prevent forum shopping, and to ensure that jurisprudence on the resolution of a dispute is consistent between the European Energy Charter and GATT in areas of overlap.

Constitutional provisions

Once the Basic Agreement has been settled it will be open for signature at Lisbon by the States and Regional Economic Integrational Organisations who have signed the Charter. The Basic Agreement and its protocols are subject to ratification, acceptance or approval (collectively referred to here as 'ratification') by the signatories, and the instruments of ratification are to be deposited with the Depositry (which the Agreement provides will be the Government of Portugal).

The Depository's function will be: to inform contracting parties of signature of the Agreement or any Association Agreements and the deposit of instruments of ratification or accession; to notify signature of any amendments to the Agreement which were adopted, the date upon which these come into force; and to give notification of withdrawals made under the Agreement.

The Agreement will come into force on the 19th day after the date of deposit of the 13th instrument of ratification. Thereafter, for later signatories, the Agreement will come into force 19 days after they have ratified. In the interim period, signatories should apply the Agreement provisionally so as not to be inconsistent with their own laws or constitutional requirements. This provision is currently under negotiation and is yet to be finally agreed.

No reservations may be made to the Agreement, however Article 41 (a provision on trade matters) provides for limited derogation from the Agreement. Article 42 sets out transitional arrangements where contractual parties are unable to comply with all the provisions of the Agreement immediately it comes into force.

Once the time for signature has expired it will be possible for other states, who have signed, to accede the Agreement, and any protocol, but only with the consensus of all the contracting parties (Article 37). It is recognised that in order to implement further the objectives and principles of the Charter, it may be necessary for other states, international or regional economic integration organisations to associate themselves with the Basic Agreement and any protocol with an 'Association Agreement'.

The Association Agreement must set out clearly the responsibilities and limitations of associate status for the state or organisation concerned. Article 38 provides that differing limitations may be applicable, depending on the number of protocols to which the body in question wishes association, the nature of the protocols and the level of association envisaged.

Each signatory is required to take measures to ensure observance of the provisions of the Agreement by regional, local governments or other governmental authorities within its domain. Additionally, each signatory agrees that if it establishes or maintains a government controlled entity shall conduct its activities in a manner consistent with the Agreement. The effect of this provision (Article 25) is to make the signatory liable where a nationalised body acts in breach of the Agreement.

Any state may at the time of signature or ratification declare that the Agreement extends to all the territories for which it is responsible, or to one or more of them. If this is done, the declaration takes effect at the time of the Agreement comes into force for that signatory. Additionally, a signatory may, at a later date, extend the application of the Agreement to its other territories (Article 36).

Under Article 43 a signatory may withdraw from the Agreement (and therefore automatically from the protocols), one year after the date upon which written notification of its intent to withdraw has been received by the Depositry.

Generally a signatory will not be able to withdraw until five years from the date on which the Agreement came into force for that signatory. An exception to this is found in Article 35, where provisions relating to the application of the Agreement to overseas territories seem to permit withdrawal of such territories, at any time, after the expiry of one year's notice.

The current draft of Article 43 provides that the provisions of the Agreement and the relevant protocols will continue to apply for a period of 20 years to investment made prior to a signatory's notice of withdrawal. This recognises that investors in energy projects will be relying to a large extent on the protection afforded by the Treaty. The objectives of the Treaty would be undermined if a signatory could simply withdraw and deal with energy investments as they thought fit.

The draft Agreement also includes certain institutional provisions. Article 29 provides for a governing Council to be established, composed of one representative from each signatory. The first meeting of the Council will be held within a year of the closing date for signature, meeting regularly thenceforth.

The Council is to keep under constant review the implementation of the Charter's principles and the provisions of the Agreement and any protocols. It is also given additional functions, including the promotion of appropriate measures to carry out the Charter's principles. It will consider the adoption of work programmes to be carried out by the Secretariat and will encourage joint efforts to facilitate and promote market-orientated reform and modernisation of the energy sectors in Central and Eastern Europe and the CIS.

It will also be responsible for monitoring the implementation of measures taken pursuant to any transitional arrangements, and will be required to consider and adopt amendments to the Agreement, new protocols and amendments to protocols, and to undertake any additional action which may be required to achieve the purposes of the Agreement.

Having set out the functions of the Council, Article 29 concludes that in 1999 and every five years thereafter the Council is to review its remaining functions. Following a review it should then amend or abolish such functions, as appropriate.

Article 31 provides for a Secretariat to be established consisting of a Secretary General and such staff as is the minimum consistent with efficiency. The Secretary General is responsible (and reports) to the Council, which is empowered to take all decisions necessary for the establishment and functioning of the Secretariat (including the structure, staff level and standard terms of employment of officials and employees).

Also provided for under Article 31 is that in the first instance, the Secretariat's functions will be carried out on an interim basis by a Provisional Secretariat until the appointment of a permanent Secretariat.

As to voting, Article 30 provides that signatories will make every effort to reach Agreement on any matter requiring their decision, adoption or approval. Any decisions regarding the funding principles of the Council or other budgetary matters will be taken by a qualified majority (consisting of that proportion of the contracting parties, who together contribute at least three quarters of the funding of the administrative costs of the Council and Secretariat). Note that this provision is not yet agreed.

In all other cases unless the Agreement provides to the contrary, decisions may be taken by a three-quarters majority of signatories present. Each signatory has one vote, with a regional economic integration organisation will have a number of votes equal to the number of its members who are signatories to that protocol. Notwithstanding provisions on majority voting, the adoption of any amendment to the Agreement itself requires unanimity. Article 30 goes on to provide that the procedure for the adoption of amendments to any protocol will be dealt with in the protocol itself.

Protocols

Under the heading 'Specific Agreements' the Charter records that in order to implement the Charter, the parties will negotiate, both the Basic Agreement and a number of protocols in good faith. Article 28 of the current draft recognises that in order to give further effect in detail to the objectives and principles of the Charter, it will be necessary to negotiate a number of protocols to the Agreement. Signatories may participate in the negotiation of the protocols and may enter into any such protocol if desired (although it was intended originally that signature of some protocols would be mandatory, this is no longer to be the case). Protocols will automatically bind the signatories to the Basic Agreement, but will only apply to those contracting parties which expressly enter into them. It will not to possible to become party to a protocol unless the state or body concerned is also party to the Agreement. In the event that the party withdraws, it will automatically be deemed to have withdrawn from all protocols.

Specific areas of cooperation identified in the Charter to be dealt with by protocol include: nuclear safety; energy efficiency; hydrocarbons; modernisation of oil refineries; inter-connection of gas networks; clean coal technology; renewable energy sources, and cooperation in dealing with major accidents.

The Committee drafting the protocol on energy efficiency is chaired by Hungary; hydrocarbons by Norway, and the protocol on nuclear safety, which of all protocols seems to have reached the most advanced stage, is chaired by Canada. Work hasn't yet begun on any of the other protocols.

Initially the various committees drafting the first three protocols were very keen to make progress. It soon proved apparent, however, that there was an area of overlap between specific protocols and the Basic Agreement. A significant number of issues needed to be resolved before protocols could be properly negotiated. Accordingly, much of the work has been put on hold pending resolution of fundamental issues in the Agreement. It remains the intention that the first three protocols will be ready soon after the Agreement has been settled.

To sum up

Obtaining international agreement to a wide ranging set of proposals which form the Basic Agreement has proved to be a monumental task. To date it has not, however, proved impossible. There is now a very real prospect of the European Charter being implemented through the medium of a legally binding Basic Agreement in the course of 1993. But it must be recognised that changes in the identities of leading political figures within the various countries from those who originally signed the Energy Charter may have an adverse impact upon those state's willingness to proceed to signature of the Basic Agreement.

Indeed, political developments over the last year have shown that not all politicians in the former Eastern Bloc welcome Western investment as the only means of revitalising their energy sectors. Likewise, the political break up of countries which have signed the Charter causes further problems, and with some commentators now predicting the break-up of the Russian Federation, this could be a major stumbling block.

The recent dispute between Russia and the Ukraine (resulting in the transportation of Russian oil through the pipeline crossing the Ukraine was prevented) demonstrates the need for the Basic Agreement.

As I mentioned earlier, implementation of the Charter by negotiation of the Agreement may well turn out to be one of the most complex negotiations ever attempted. But the reward to the parties is greater than that offered in any previous treaty, in terms of a promotion of peaceful coexistence, the security of energy supplies, and the attraction of investment to revitalise depleted industries. For this reason each of the signatories to the Charter should have a very real incentive, not only to complete the negotiation of the Basic Agreement, but also to sign and ratify the same as quickly as possible. ❑

Viable energy policy and economic recovery

*by Professor W Hryniszak**

THERE follow some thoughts concerning the energy scenario in general, and in the UK in particular. These views are limited to the effect of a rapidly advancing technology, which because of its importance, will gain a predominant role in the policy making of governments and industries.

A well-defined national energy policy, taking into account the effect of technological advancement, could make a considerable and lasting impact on the efforts to reduce unemployment and could therefore be essential in achieving a speedy economic recovery.[1]

Energy in the future will be increasingly affected by coal — whatever the political aspects concerning it may be.

Gaseous fuels such as natural gas will be those preferred for gas turbines for the following reasons: coal can be gasified in an effective way and turned into methane; heat can be used to reform this methane to gaseous hydrocarbons with an increased calorific value; such heat may be produced in future from nuclear power, especially if in a transition period, emphasis will have to be placed more and more on this form of energy.[2]

Plants for gasification of coal are well known and have been used on a large scale, mainly in the context of turning coal into liquid fuels. There is a wealth of knowledge as well as practical experience in the use of this technology.

The value of having a capability to produce hydrocarbonous fuels from coal was proved in recent history and over a considerable period of time in highly industrialised countries temporarily deprived, for one reason or another, of the import of oil and oil derivatives.

Not only would coal gasification in large, strategically well planned plants feed clean methane into the already existing transport and distribution system, but it would prevent reducing the number of jobs in the mining industry and the industries serving it, below a dangerous level. Viable permanent jobs could be created in the course of building, constructing and operating the coal gasification plants.

It may well be that a switch of investment, mainly from the service to the manufacturing industry; a switch from a short-term to a long-term strategy, may prove vital to turn the tide back from 'negative' to positive growth.

Government is contemplating creating competition for British Gas. Producing 'synthetic natural gas' from coal could provide an excellent opportunity. A 'neutral' gas distributor, responsible for maintaining and extending the network of pipelines as well as any other activity related to it could be a complementary 'third'.

Both British Gas and British Coal by the way have conducted valuable research and development work in the context of coal conversion.

In future constructive collaboration between coal, gas and electricity interested industries could be of great benefit to all participants.

Perhaps it is worthwhile mentioning that natural gas, especially when liquified, has a worldwide commercial appeal and transport by land or sea has reached sufficiently high safety standards.

Coal gasification and its usage in combined gas/steam turbine plants is being vigorously pursued in the USA, where, because of the geographical situation, the gasification plant is installed in close proximity to the power plant.

In a policy statement by the US Government, the reason for this development is to achieve an increasing independence from imported liquid fuels.

Petroleum's share in the deficit of the USA was 67% in 1991.[3] This figure does not include the indirect expenditure incurred in the attempt to maintain an adequate, uninterrupted supply of petroleum products, and there are many components contributing to the resultant expenditure, which by the way is not only related to safeguarding the present, but even more so the future.

In any effort to assess the value of measures to be taken in the context of coal gasification, such a broad view with regard to costing is essential and should be a prime factor in any decision making.

Combined gas/steam turbine plants have already achieved an efficiency of 54% with a good potential for increasing independence from imported liquid fuels.[4]

Combined gas/steam turbine plants have already achieved an efficiency of 54% with a good potential for increasing it in the foreseeable future to about 60% due to improved waste heat utilisation. This fact, together with the favourable conditions offered when burning natural gas (or any other gaseous hydrocarbons) as far as the environment is concerned, is another good reason for the combined gas/steam turbine to be favoured at present and in the future.

Whereas with coal burning plants, meeting environmental demands pose considerable technical problems, resulting in high cost for cleaning of the flue gases, gasification of the coal, ie, producing methane, permits cleaning this gas from undesirable contamination in the course of the process and therefore allows burning 'coal' under the same favourable conditions as natural gas.

It has been proposed to link the British Gas grid with that of the Continent. One result of such an enterprise would be the establishment of a collaboration between the coal producing countries of the EC, creating an opportunity to feed the common grid, apart from natural gas with clean methane derived in an environmentally acceptable way from coal. Thus a basis would be created to safeguard the long-term energy supply for Europe by exploiting the large coal deposits of its member countries.

Some of those countries, especially in the Eastern part of Europe and the neighbouring countries of Asia, are subject to further essential developments in order to improve living standards. In those countries, contamination of the atmosphere, especially from coal burning power stations and other coal using industries, is at its worst.

Rapid change to the better is imperative

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not only in the interest of Europe. Costs for the necessary improvements, apart from the cleaning up actions, are mainly related to modernisation of the plants contributing to the pollution. These costs are enormous in accordance with recent estimates.[5] Most urgent in the course of such an improvement is to avoid burning coal in the present established way. That means switching to the modern gas-fired combined cycle plant, the gas being either natural or coal derived. In this context it seems worthwhile mentioning that the natural gas used in Central Europe is partly imported from some of the countries in question, who will themselves require it in due course, and on a large scale for improvement of the performance of their own industry.

The EC originally evolved as a European coal and steel community. A joint European research and development programme aimed to achieve further improvements in coal technology — and there seems to be scope for success — could strengthen important scientific and technological collaboration in general. The plants required in the course of such development could also benefit the economically hard-pressed steel industry.

Combined gas/steam turbine plants maintain their efficiencies even if built in smaller sizes than at present demanded. This, together with a highly developed network of gas pipes in this country would allow using smaller plants, combined with an air conditioning capacity wherever desirable, on strategically well-chosen sites to reduce transmission losses, at the same time eliminating unpopular high power transmission systems.[8]

These plants in future could play an important role in the further development of countries of the Third World and could therefore have an important export potential.

The reported efficiency of 57% attained with demonstration units of what is called the 'adiabatic' (or ceramic) piston engine can be matched in due course by that of the less complex small gas turbine, employing a simple thermodynamic cycle with a capability of recycling waste heat in a simple, effective and efficient way. The aim in this development — of great importance for the future — should be to achieve initially efficiencies of 40-50%; considerably higher than that of any existing petrol or diesel engine.[7]

The availability of brushless, high speed electric motors and generators has greatly improved the chances of widespread use of such small gas turbines for electricity generation (again when required, coupled with air conditioning), as well as in road transport and other applications.

The market potential for small gas turbines employed for such purposes is vast.

The production of domestic and industrial waste has reached such proportions that it could become, in addition to electricity consumption pro-rata another yardstick of the state of development of a country. Because of the ever increasingly stringent environmental requirements, waste disposal could become a part of a viable energy policy.

Converting hydrocarbonous waste into a fuel perhaps by gasification, recovering important constructional materials from waste are all energy related, the relevant activities being still subject to a rapidly advancing technology.

The importance of waste management, the progress still required with regard to perfecting the processes involved, and the establishment of a viable industry capable of realising these processes, together with the activities linked with an effective collection of domestic waste as the 'raw material' for this industry could be controlled and advanced by a national effort and could be part of our energy policy.

Waste in its totality requires international management for environmental reasons. Certain chemical, but even more so, nuclear, wastes demand application of the most advanced technologies and skills. Establishments of international laws and the power to implement them is vital for the future of mankind in this context.

It has been estimated that within the lifespan of one generation the sources of natural gas will be exhausted; a very good reason for starting now to develop ways and means for producing from hydrocarbonous stock a 'synthetic' natural gas.

Cost estimates concerning such gas have proved in the past, to say the least, inadequate for a number of reasons, especially those concerning a possible future related scenario. Furthermore, as recent events have shown, to forecast any monetary value to which costs are related can be subject to doubt.

Furthermore, with a rapidly increasing global demand for natural gas, especially in its liquified state, enhanced by the possibility of safe transport, the price of this kind of fuel is bound to rise steeply as it becomes more scare.

A decision acceptable internationally with regard to the use of nuclear energy will have to be taken soon — a decision of utmost importance.

An existing stock of plutonium, already steadily growing because of spent fuel processing, has suddenly increased by thousands of tons of weapon grade plutonium to an extent which is of great concern. The only employment of plutonium known is in the reactors of electricity producing power plants.

With an ever increasing world demand, especially for electricity, with rapidly dwindling resources of hydrocarbonous fuels, and at least at present inadequate sources of renewable energy, the time may come in the not too distant future when nuclear power becomes the only realistic solution to the problem of satisfying an ever energy-hungry world, determined to improve its living standards at all costs.

The author

Director of the Nuclear Power Group, and Chief Executive of Advanced Material Engineering Ltd. Additionally he was a member of the Supervising board of that company's German associate.

Professor W Hryniszak, born in Vienna, graduated at the Technological University of Vienna and holds degrees of Diploma Ingenier and Dr of Science (Technology). He obtained his Dr Habil degree there, entitling him to lecture at university level. He also read at the Akademie of Economic and Political Sciences (Konsular Akademie, Vienna).

He gained experience initially in Austria (designing and planning of road transport) and then in Germany in light industry (Junkers, Heinkel, initial developments of jets and jet-propelled aircraft); medium industry (Kloeckner Humbold Deutz, turbo-supercharging of large two-stroke engines), and the heavy engineering industry (Brown Boveri, gas turbines) before he came to the UK in 1946.

In the UK he has worked at CA Parsons (gas turbines and gas-cooled reactors), and Clarke Chapman — both companies now with NEI, a member company of the Rolls Royce Group, with whom Prof Hryniszak became Technical Director and Main Board Member, as well as Chairman of the Advanced Technology Division. He was also

Prof Hryniszak is an Honorary Professor of the Technical University of Vienna and lectures at its Institute of Energy Economics. For many years he was a Visiting Professor of the University of Newcastle upon Tyne.

Usage of nuclear fuels, especially in fast breeder reactors which may prove a necessity in the future, means application of the highest standards of technology and — most important — further improvements in existing standards. Such standards are certainly not available in the majority of countries in the world, which require energy on a large scale to progress their living standards to the point where greater stability can be achieved and maintained.

Research into nuclear particles and the effect of their collision continues on a large scale in most highly industrialised countries. Progress made is impressive and promising. Risks taken and rewards gained by taking them are often proportional. In other words, the above research may one day lead to a safe and inexhaustible source of energy, solving the most important problem of mankind. Creating and recreating, converting and reconverting energy on a universal scale is after all, the pattern of the cosmos.

Market forces, although important, cannot be the only consideration when it comes to formulating a policy catering for the future —policies as those concerned with a country's independence, its way of living, and last, but not least, maintaining and improving living conditions. All these policies are best formulated by expertise and their implementation depends ultimately on industrial pursuit demanding energy for fulfiling expectations.

Therefore an energy policy has a decisive effect on the destiny of a nation. Its importance is enhanced by the growing worldwide unrest ultimately caused by unacceptable living conditions. To attempt to achieve a world of peaceful co-existence may urgently require national and international developments of a magnitude which can only be undertaken by employing the full potential of highly industrialised countries.

This only seems possible if new markets are developed with a high degree of urgency, especially in countries with at present dangerously low living standards making them prone to ethnic, religious and other strife, already leading to an increasingly unstable world.

Extensive, as well as intensive, long-term investment is required whereby a political, social and economic scenario must be established on an international level, making such investment both safe and worthwhile.

In any action of this kind, the availability of energy is imperative, together with making use of the most advanced energy saving and environmentally acceptable technology. The demand by the countries concerned is not for democracy, but for a government which is capable of providing and maintaining improvements in living conditions. Therefore advanced technology becomes one of the most important components of a nationally acceptable form of government.

In the world of today and tomorrow, developing the indigenous energy sources, especially of a highly industrialised country with due regard to its future, means and methods to use the resources, not only in an environmentally acceptable way, but most economically, and to develop the necessary technology swiftly and effectively is a 'must' for securing its future. Such an effort creates new permanent jobs and can prove the most effective and speedy way to an early economic recovery.

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Energy policy and institutional change

*by N J D Lucas**

Professor Lucas examines the framework for regulating the privatised energy sector, addressing the topic through the consideration of three questions: is there a problem? What is being done about it? And, what more is needed?

THE UNITED KINGDOM has gone further than other countries in transferring control of the energy sector to private operators. Decisions made by these operators will inevitably have political repercussions. Their commercial decisions will affect the availability and price of energy, and therefore industrial competitiveness. Their choices of technology and investment will have enormous implications for social, regional and industrial policy and will affect national security.

Evidently government has to set a framework within which these companies will operate. I want to examine whether there are problems in doing this and if so what can be done to improve management of the sector.

The first question to consider is: Is there a problem? Evidently so, or we would not have the Coal Review. But I want to look beyond that, to see whether we can confidently expect that our present troubles are no more than a temporary difficulty to be sorted out for good by the Review, or whether there are systemic faults which, if unaddressed, will lead to new problems in the future. There appear to me to be six classes of complaint that are current:

- that there have been few visible concrete benefits of privatisation;
- that competition has not been satisfactorily established;
- that regulation has been uneven and sometimes ineffective or confused;
- that gross conflicts have emerged between market and social interests over long-term choices;
- that responsibilities for policy, regulation and operation are muddled or obscure;
- that there is a lack of political accountability and control.

It is not possible to examine each of these complaints in detail. So I will give for some of them a bald statement of my prejudices and elaborate briefly on those which are most germane to the issue.

The first three classes of complaint (concrete benefits, adequate competition, uneven regulation) do not, in my view, lend support to any case for institutional reform. I believe that there are operational benefits to be achieved from a liberalisation of the energy markets, although these are small compared to the damage which could be done if the process of transition is badly managed. The handling of the coal industry is a case in point.

We can confidently expect improvement. With sufficient will, competition can be introduced into large parts of the market, and because we have some sort of model of what to expect from the operation of a competitive market in the short term, we can learn to regulate any parts not subject to competition and to monitor the rest to ensure that the whole mimics a competitive market. For this purpose the present arrangements, plus the inevitable learning process, are largely satisfactory, although more transparent pricing would help the market along.

It is the latter three classes of complaint (inappropriate long-term choices, muddled responsibilities and lack of political accountability) which, if substantiated, would support a case for some institutional reform.

The complaint of inappropriate long-term choices I will take to be largely substantiated by the dash for gas, which in most part is uneconomic and has a substantial non-market debit also. I would argue that the poor prospects for nuclear within the present scheme indicate a similar failure, although not so clear cut.

The charge of muddled responsibilities is well reflected within the present institutional structure. The National Grid Company (NGC), essentially an operating company, also has the responsibility to produce a seven-year statement on the evolution of the supply and demand for electricity, a strange juxtaposition of functions. The regulatory institutions appear to be making policy as much as implementing it. Decisions are taken by one regulatory office which, while logical from its own perspective, may be damaging in another context. The insistence of OFGAS that British Gas should lower its tariffs for interruptible gas for power generation against the commercial view of the company was a significant boost to the dash for gas at a critical stage. The particular and special view taken by OFFER of its responsibility to interpret the economic purchasing requirement in the licenses of the public electricity supply companies has had enormous implications for the coal industry. On energy conservation, contrary positions were initially adopted by the regulators with respect to the pass through of costs within the cost formula. OFFER in this case appeared to be undermining government policy. In this instance OFFER has apparently subsequently changed its position.

The last complaint is of a lack of political accountability. As I understand it, OFFER and OFGAS are subject to the general guidance of the Minister, but their activities are not subject to parliamentary control — they cannot be the object of parliamentary questions. So a Minister can to some extent direct the agencies, but is not apparently answerable to Parliament.

The exact nature of the relationship between the Minister and the regulatory offices is mysterious, even occult. It is the kind of system which suits the kind of politi-

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cian who has no policies, but who can fix anything, and probably that is, in part, why we have it. This observation is not meant to be pejorative; it is the operational side of the traditional UK position: "we have no policy; that is our policy".

Consequently, the energy sector is littered by attempts to 'fix' specific issues. The character of the contracts between the coal industry and the generators and the RECs is an example. The NFFO is another. The Coal Review will be next. Something will be needed to manage the CO_2 stabilisation target. Interventions are not guided by any apparent long-term and comprehensive policy, nor by clear lines of political responsibility and accountability.

So, I would claim there is a problem, essentially arising from an unsatisfactory separation of functions and inadequate political accountability, and that these have particularly acute consequences for the handling of long-term issues not satisfactorily handled by the privatised industry and its regulators.

What is being done?

In the face of an enormous manifestation of public disquiet and to save its own skin within the House of Commons, the government is to produce a White Paper on energy policy. The last White Paper on the subject was produced in 1967: oil and gas in the North Sea were just a promise; the AGRs had just begun commissioning and the retreat to PWR was not envisaged; the oil crises of 1973 and 1981 were unimaginable; global and regional environmental problems were scarcely given a thought; we had not joined the European Community; there was no hint of privatisation, and Communism in Europe was still with us. Now, thanks to avoidable domestic error we will have a new White Paper. Is this welcome?

It will be useful to have a clear and comprehensive statement by government of its objectives for the sector, the extent of its responsibilities as it sees them, and the means and purpose of its intervention in this sector. The review is welcome, but to my mind, it is not in itself enough. Different issues will arise in the future and old issues will appear in new form; the environment, commitments under international treaties, security of supply, the nuclear industry will all predictably require fresh intervention. It is not a credible that a one-off review will set the present structure going in the correct direction for ever. It is no substitute for an adaptable mechanism of policy formulation and regulation appropriate to present industrial structures and capable of dealing with issues as they arise.

Moreover, the whole approach implicit in a White Paper is of restricted application in today's circumstances where large and powerful private companies must be guided to serve the national interest. Instruction from above, prepared largely within the civil service, made sense within a predominately state owned industrial structure. Even today there are still mechanisms by which government could exercise close control within a privatised industrial structure, but on the whole it is sensible in the new circumstances to involve the operating companies in contributing fully and openly to the design of any energy policy or strategy which is to be established.

What more is needed?

Reiterating my argument so far, intervention by government in the energy sector is inevitable, the present arrangements obscure responsibility and accountability are rather secretive and do not formally involve the large private sector operating companies. To my mind, any reform should achieve three things:

- restore responsibility for policy to political institutions.
- restrict regulatory activity to the monitor ing and enforcement of established policies and minimise confusion of roles and responsibilities;
- foster analysis of issues and options in a manner which involves all affected parties and which provides a solid basis of fact and opinion on which government can base decisions.

One way of doing this would be to create a single Energy Agency responsible for monitoring and implementation of all aspects of energy policy, gas and electricity, but also coal and oil. This Agency would be directly responsible to a Minister and through him to Parliament. The responsibility for the formulation of policy and strategic decision would lie with the Minister. Mechanisms to manage a private industrial structure would have to be devised, but this is not impossible. For example, if licenses could be offered for power station construction specifying fuel, but otherwise open to competitive bidding.

An Energy Commission would be established, on which the private operating companies would be represented, to make long-term analysis and illuminate issues and options. The conclusions of this Commission would not necessarily be unanimous, but would provide the basis of fact and interpretation necessary for government to form policies congruent with its aims and the capacities and expectations of private companies. My colleague Professor Ian Fells and I have been advocating such a Commission for some years, indeed since 1972 when we proposed it in a publication for the Institute of Energy entitled *Energy for the Future*. To my mind, the case is strengthened by the present need to guide a largely privatised sector, with divergent interests and agendas, and to achieve as much support and understanding as possible from within that constituency.

Other options have been formulated. Dr Dieter Helm, in evidence to the Select Committee on Trade and Industry, has proposed an Energy Agency to carry out energy policy which would consolidate OFFER and OFGAS and extend their powers, including perhaps the duties to produce capacity forecasts and to licence power stations and to design or implement taxes and subsidies.

If I understand this proposal correctly, it attributes responsibility for large elements of the content of policy to a regulatory agency, although subject to general government guidance. It also attributes to this agency extensive analytical functions. I would be concerned that the present regulatory offices already have too much influence on the content of policy and that experience to date is not encouraging. Although I agree that the present responsibilities of regulators should be widened to include responsibility for implementing other instruments of policy, I would be unhappy to see them deepened in the sense of moving more towards the design of policy. Moreover, I do not think that the responsibility for capacity forecasts and analysis of desirable policy instruments is best attributed to a regulatory agency. I would prefer to see decisions on these matters made by government on the basis of analysis, and proposals reached by an independent body on which industry was represented.

I should like to anticipate one certain criticism that central planning has been shown not to work. I agree and I am not advocating any such thing, which denial will not prevent people saying that I am. It is true that civil servants cannot forsee the future accurately. Believe it or not, this weakness is shared by private enterprise. But government does have a responsibility, which it cannot avoid, to do its best to anticipate future developments, many of which may not be on the agendas of the private companies who operate in the sector. To do this it needs the best possible cooperation from those companies and needs to listen to them, and in return to permit them as much freedom as is possible within the bare minimum of constraints. These requirements I have tried to suggest can be met by: clear political accountability for policy and separation of policy formulation from regulation; coordinated regulation across the sector, and profound analysis of issues and options within an independent forum enjoying the participation of all interested parties. ❑

Energy crackdown at Royal Marine Barracks

The Government is cracking down on wasteful use of energy. It has issued a 'green edict' to all its departments — including the Ministry of Defence — to reduce energy consumption by 15% from 1990/1 to 1995/6. Here we see how one major defence installation is meeting the Government targets.

ROYAL MARINE Barracks Seaton, four miles from Plymouth, Devon, is home to Commando Logistic Regiment Royal Marines, responsible for the supply of vital equipment to the front line. It was built in the 1930s for the Army.

David Snelgrove, works liaison officer (Seaton) was appointed as energy efficiency officer. His task was to work with Malcolm Pirie, PSA site officer, to identify areas where energy costs could be saved and to institute policies to cut energy use.

Three large buildings were chosen as likely candidates for major energy saving. They were the workshop for the Military Transport wing of 59 Commando and Medical Squadron, the building used to service and repair army and marine Land Rovers, tanks and amphibious craft, and the large gymnasium.

In all three cases the buildings were only used intermittently. However the lighting and heating, once switched on for the day, remained in operation regardless of the occupancy patterns.

Having only small windows and skylights it was possible for lights to burn endlessly in unoccupied areas without being noticed from the outside of the buildings.

The wide use of Son discharge lights, which took a full 20 minutes to fire up, went some way to explain why the lights were not switched off when the areas were vacated.

The energy team's first move was to replace the lighting with high frequency, 3 500 K daylight fluorescent twin five-foot tubes. This had an immediate impact on energy use. But being brighter, and having no flicker or strobe effect, mechanics found the lighting much more suitable for vehicle repair and servicing work, an important health and safety aspect.

At the same time new gas radiant and gas blown warm air heaters were installed in the three buildings.

The energy team realised that if the light and heat could be controlled depending entirely on need, then the potential for energy saving would be dramatic.

So their next task was to look at ways of installing control systems that would control both the lighting and heating to ensure they were only in use when the buildings were occupied. The heating had been controlled by timers, but this had proved unsatisfactory. Because of the occasional need to use the buildings outside controlled hours the system was too inflexible.

The energy team also ruled out passive infra-red control as that would not be sensitive enough to keep the lights on when areas are occupied for extended times. The risk would be run of the area being unexpectedly plunged into darkness.

After an evaluation of SEG-listed Government suppliers, Ex-Or Ltd, makers of presence detection energy control systems, were awarded the contract to supply controls for the three buildings.

The installation was an in-house contract involving the Works Liaison Team and the Term Contractor on site.

The controls specified use microwave presence detection technology to automatically ensure the lights and heating remain off in unoccupied areas. They continuously monitor the slightest movements made to keep the lights and heat on whenever the monitored areas are occupied.

In addition, photocells were incorporated into the detectors. These ensure the lights do not go on when there is sufficient natural light.

Thermostatic controls were installed to ensure the heating remains off during the summer months and whenever temperatures rise above required levels during the heating season.

In addition the heating comes on automatically irrespective of time or occupancy, when temperatures drop to a pre-determined low level.

The systems were installed in October 1991 and commissioned by Ex-Or some weeks later, following a short period for fine tuning and adjustments. Said Malcolm Pirie: "The installation went very smoothly. We

Pictured from left to right: Malcom Pirie, PSA site officer, and David Snelgrove, works liaison officer at Seaton, who worked together to identify areas with potential for an increase in their energy efficiency; and John Remnant, Ex-Or sales executive.

have spoken to all departments using the buildings and they have all praised the operation."

Reducing energy consumption is the main reason for installing any energy conservation system. Mr Pirie said it was difficult to quantify precisely the cost savings made as other, unrelated, installations had added to the energy load — the erection of perimeter security lights and the addition of heaters, for example.

However it is estimated that the heat and light control system is now saving more than £2000 a year on the site, giving a payback period of less than four years — with the guarantee of savings continuing to be made in future years.

"From an energy point of view there is no doubt the energy load has reduced and that significant savings are being made as a result of the installation," said Mr Pirie.

The new system offered an important safety aspect too, he added. At any time the workshops could be home to anything from an armed Chieftain tank to an amphibious combat engineer tractor.

"With the new control system someone walks into the building and the lights come on automatically — there is no fumbling around for an elusive light switch in the dark."

The system met two other vital needs of the Barracks. "Speed of delivery and installation was vital. We are totally geared to offering a fast response and we expect that from outside contractors," said Mr Pirie. "Also the system had to be flexible enough to cope with all manner of changes of use that the buildings may undergo in the future. For example the use of one of the buildings has changed twice in the last eighteen months."

Boxing practice in the gym at RMB Seaton.

Ex-Or, which is currently implementing a BS 5750 quality programme, designs, supplies and installs presence detection control systems for many types of industrial and commercial buildings in the public and private sectors.

New Members

Fellow

Atholl Duncan Fairley Robertson, Siemens Ltd, South Africa *(transfer)*

Member

Kevin Michael Barrett, Guinness Brewing International, London
Graham Thomas Dixon, Robert Gordon University, Aberdeen
William Wai Sun Fung, Ryoden Engineering Ltd, Hong Kong
Catherine Elizabeth Ho, Building Simulation Ltd, Herts
Magdalena Momirlan, Institute of Physical Chemistry, Romania
Richard William Pooley, Nuclear Electric plc, Suffolk
Carlos Leopoldo Villanueva, *(transfer)*

Associate Member

Alistair Michael McKeown, Roberts & Partners, Edinburgh
Lindsay Roberts, Merz & McLellan Ltd, Newcastle upon Tyne

Associate

Richard Michael Atkinson, Airheat, Orpington, Kent

Graduate

Kay Susan Garbett, Thermal Engineering Division, MRS, Solihull
Martin McKintosh Brown, Bass Brewers plc, Hants

Student

Dotun Ajasa, South Bank University, London
Mohammed Adeeb Al-Saraf, University of Newcastle upon Tyne
Francis Michael Byrne, Cranfield Institute of Technology, Beds
Mark Andrew Challinor, Coventry University
Kevin Joseph Connolly, Sheffield Hallam University
Glen Cooper, University of Newcastle upon Tyne
Stephen David Andrew Finlay, University of Glamorgan
John Stewart Fleming, Napier University, Edinburgh
John Gaw, Napier University, Edinburgh
Martin Thomas Meath Hill, Imperial College, London
Duncan Kelso Hislop, Cranfield Institute of Technology, Beds
Roy Reginald Joseph Hughes, Coventry University
Andrew John Janney, De Montfort University
Collins Demba Konayuma, Cranfield Institute of Technology, Beds
Segal Lad, University of Newcastle upon Tyne
Jacky Mary Lawrence, Coventry University
Geoffrey Robert Nicolas Leyland, Napier University, Edinburgh
Mahesh Mehta, South Bank University, London
Colin Andrew Charles Moody, Cranfield Institute of Technology
Claire Mycock, University of Newcastle upon Tyne
Priti Nanubhai Patel, University of Glamorgan
William Norman Pearson, Napier University, Ediburgh
Andrew John Peters, Loughborough University of Technology
Thabang Dutton Phuroe, Cranfield Institute of Technology, Beds
John Richardson, University of Leeds
Darren Robinson, Cranfield Institute of Technology, Beds
Heather Smith, University of Newcastle upon Tyne
Jonathan Spriggs, Staffordshire University
Michael John Sumner, University of Newcastle upon Tyne
Claire Helen Wilson, University of Newcastle upon Tyne
Teresa Woodcock, Coventry University

PHOTOGRAPH BY R F LARKIN

Pictured above are the top table guests at the North Western branch annual dinner, held on 19 February. From left to right: Michael Roberts, President of the Institute; L Abrams of ECRO; Dr J Rae, Chief Executive of AEA; Mrs H Elletson; Harold Elletson MP; D Connell, Chairman of the North Western branch; and A Penny of the Chartered Institute of Building Service Engineers.

Joint forum on coal

'BRITAIN'S energy policy and the coal crisis' were the subjects of debate by a forum of knowledgeable speakers from private and national industries, academia and institutions, including the Institute of Energy.

The forum, which was held just before Christmas, was jointly organised by the Institute of Energy, the Institution of Electrical Engineers, the Institution of Mechanical Engineers, the Institution of Civil Engineers and the Watt Committee.

Issues covered by the debate included: should Britain maintain a viable coal industry? does the gas for gas make long-term economic sense? the environmental dimension; the facts underlying energy pricing; and the development of a long-term strategy for power supply. The forum did not expect to find the answers to all these questions, or any straightforward solution to the conflicts of interests involved, but discussions did serve to highlight the complexities of the situation, and promote a greater understanding of the issues.

Speakers included Professor Michael Laughton, Dean of Engineering at Queen Mary & Westfield College, Dr James Smith, Chairman of Eastern Electricity, David Lewis, Vice-President of ENRON Europe, John Chesshire of SPRU and Dr Peter Chester, Chairman of National Wind Power.

Edited proceedings have just been published in paperback by the IEE, and include edited coverage of the ensuing discussion. They are available from IEE, P O Box 96, Six Hills Way, Stevenage SG1 2SD. Tel: 0438 313311; fax: 0438 742792, price £7.50. Personal callers at IEE headquarters in Savoy Place, London, can obtain copies at a 20% discount.

A solar collection

'Simulation of Water Based Thermal Solar Systems: EUROSOL — An Interactive Programme' by Willie L Dutrie Published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1991, pp 256, £52.00 H/B.

'European Simplified Methods for Active Solar System Design' by Bernard Bourges Published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1991, pp 393, H/B.

'Test Procedures for Short Term Solar Stores' by H Visser & H A L van Dijk. Published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1992, pp190, £41.00 H/B.

'Endoreversible Thermodynamics of Solar Energy Conversion' by Alexis de Vos. Published by Clarendon Press, Oxford, 1992, pp 186, £25.00 H/B.

IN THE preface to Dutre's book and the forward to Bourges's book, Theo Steemers, Programme Manager with the Directorate General of the CEC Solar Energy Research and Development programmes, points out that the events leading up to the publication of each book started effectively in 1976, with the exchange of information between those modelling teams in Europe involved in the CEC Solar Energy R & D programmes. It appeared there was very little experimental data available for model variation, and the CEC took the initiative to support the construction of Solar Pilot Test Facilities on eight European sites.

Each experimental facility consisted of two real solar heating systems with collectors, storage, controls, and associated piping, but with the thermal distribution system of the 'dwelling' replaced by a physical load simulator. One solar system on each site acted as the reference system and was identical for the eight participating teams. The simulator was capable of producing a typical thermal load for a house, interactive with the actual weather, and took into account the effects of the occupants.

National simulation programmes were validated with data from these facilities and, in parallel, so was the common modular European programme EMGP2, which could only be operated on a mainframe computer or under special conditions on a mini-computer. EMPG2 then formed the basis for the development of EMPG3, EURSOL, ESM1 and ESM2. All these software packages have been developed for the PC as the result of the efforts of a large group of European researchers coordinated by Professor Dutre.

EURSOL is a system specific simulation programme for a frequently encountered group of solar systems, yielding detailed system energy balances and full flexibility with regard to all system descriptive parameters. ESM1 and 2 use simplified correlation methods for rapid calculation of solar system performance and sensitivity to the main system design parameters. For EURSOL, Steemers comments that it is the first fully validated, user friendly, interactive, system specific, active solar heating programme running on a PC, while ESM1 and 2 are the first fully validated, user friendly, simplified methods for active solar system design.

The treatment in each text reflects the different emphasis placed by the editors on presentation, and it is probably better not to attempt to reconcile their different approaches and assumptions.

For example, the equation for solar declination is based on radians in EURSOL, and degrees in ESM1 and 2. EURSOL prefers solar time to be in minutes, and ESM1 and 2 use hours. EURSOL is written as a manual to accompany the system software, and the text assumes that this is available.

Bourges and his colleagues have chosen to describe the European simplified methods for active solar system design more as a text book, from which particular sections could be abstracted and studied as required. Any further information about the design tool software can be obtained directly from the Energy Research Group at University College Dublin (on behalf of the Commission of the European Communities).

Active solar system design also includes the heat storage vessel, and the third book deals with test methods developed by the European Solar Storage Testing Group, described as essential for the harmonisation of European norms and standards. This text is also written more as a text book, with all the details of the parameters clearly described, and those interested in exploring computer models could get in touch directly with the authors at the TNO Institute of Applied Physics in Delft.

One criticism of all these three CEC-sponsored texts is that they have no index. This detracts from their value as educational texts.

Alexis de Vos, in sharp contrast, has written a text which will appeal to all who prefer to study their thermodynamic fundamentals from one source. He has attempted to describe the various forms of solar energy conversion techniques from the physical framework of endoreversible thermodynamics. The solar systems which are considered are not in equilibrium, ie, entropy is continuously created.

General principles are illustrated using idealised models, with a few technical applications selected to illustrate the comparison between actual systems and the theory. The text also reflects the input from the wide variety of sources mentioned in the preface, with the result that it has freshness and clarity which will appeal to those with a sound mathematical background and good grounding in thermodynamics. It will be somewhat daunting for the layman, but that is not the market the author is addressing. Some of the work in the US, for example by Chih Wu of the US Naval Academy, is not cited, but as the author rightly points out, he has not aimed for completeness. There is a good index and an extensive group of appendices. An invaluable introduction to a fascinating developing field.

Dr Cleland McVeigh

A wealth of data

'World Nitrogen Survey' by K M Constant and W F Sheldrick. Published by World Bank, Washington DC, 1992, pp 190.

THIS IS Technical Paper number 174, which contains a wealth of tables including historical data and forecasts of tonnage and finance. The main product is ammonia but urea has an important contribution to the market.

Originally founded on coal the production now prefers the use of natural gas for energy on the grounds of higher efficiency and lower capital cost. The main processes are high temperature fixation of nitrogen by hydrogen, desulphurisation, reforming, CO-shift, conversion, CO_2 removal and methanation. Economies can be made by improved efficiency of conversion and by waste heat recovery. Only a minor part of the nitrogen is applied to fibres, explosives and other non-fertilizer applications.

There is a challenge to the greater economy of larger and larger plants. There is also concern over environmental degradation related to nitrogen fixation by hydrogen and over the nitrate content of drinking water.

Nigel Gwyther

Recently published

'1993 NSCA Pollution Handbook' Ed by Loveday Murley, published by the National Society for Clean Air and Environment Protection, pp 464, £19.95 (inc p&p) from The National Society for Clean Air, 136 North Street, Brighton BN1 1RG. Tel: 0273 326313.

'British Coal's Best Pits: A Mine by Mine Assessment' by Alan Oakes & Associates, published by McCloskey Coal Information Services, £9500.00. Tel: 0730 265095; fax: 0730 260044.

The WISE path to a career for women

INITIATIVES to encourage girls and women to consider a career in engineering are listed in a guide published in February this year.

The Engineering Council's publication *Awards, Courses, Visits* is a key part of the Women Into Science and Engineering (WISE) campaign, listing courses, visits, awards, career break schemes and other initiatives to attract women into engineering.

The guide is divided into sections according to appropriate age groups from 13 years old upwards. There are a number of courses providing girls and women with practical help. Some courses have hours to suit mothers of children at school or offer childcare facilities.

Copies of *Awards, Courses, Visits* are sent to all secondary schools in the UK, careers services, further and higher education institutions. To promote the activities more widely to women returners to work, the booklet is also being sent to all main libraries.

The publication is sponsored by the BICC Group.

Copies are available free (please send an A5 sae) from The Engineering Council, 10 Maltravers Street, London WC2R 3ER.

Double scoop for Glamorgan University

THE UNIVERSITY of Glamorgan has won two prizes for the excellence of its teaching, scooping two of 22 awards on offer in the fourth annual Partnership Awards.

The Partnership Awards were designed to promote and reward innovation and creativity among teachers in higher education. Organised by an education charity, the Partnership Trust, and sponsored by major UK companies, each award is worth £4500.

Glamorgan's awards are both in the field of engineering. The degree course in Electrical and Electronic Engineering offered in the Department of Electronics and Information Technology won the Pilkington Prize for The Business Education of Engineers (previously held by Templeton College, University of Oxford), while the ESSO UK Prize for Safety, Health and the Environment in Engineering has been won by the Energy and Environmental Technology degree course of Glamorgan's Department of Mechanical Engineering.

Chairman of the Awards, Dr David Brancher, commented "To win not one, but two awards is a considerable achievement. There has always been a strong Welsh tradition for excellent teaching, and Glamorgan's success shows this is being admirably continued by the new University."

Sharper focus for technology in schools welcomed

PROPOSED changes to the national curriculum will give the subject of technology a 'sharper focus', according to the Engineering Council.

Director General of the Council, Denis Filer, congratulated the Government following their announcement that technology is to be revised. The Government had listened to the Council's plea to 'rescue' the subject, made in an Engineering Council report called *Technology in the national curriculum*, he said.

The report claimed that the subject of technology in schools had emerged as a mess, and that children's understanding of its meaning is quite different from the commonly held perception.

The Engineering Council believe that technology will now be clearly established in the national curriculum as a practical/technical subject, concerned with the design and manufacture of products and systems. They see a much clearer progression in the content of the subject, which in turn should provide a stepping stone to higher education and employment.

The revised plan for the subject proposes two Attainment Targets (ATs) of 'designing' and 'making', replacing the current four targets, which are: identifying needs, generating a design, planning and making, and evaluating. The Council believes the new approach provides a more simple and specific structure, helping both teachers and students.

The 'designing' AT will carry a 40% weighting for assessment purposes, with 'making' at 60%.

A programme of study accompanies the new ATs, covering construction materials, food, control systems and energy, structures and business and industrial practices.

On a cautious note, Denis Filer of the Engineering Council, expressed the hope that the "proposals will be followed up in due course by more detailed guidance on the 'design and make tasks', as it appears that the subject will be largely delivered through these tasks, will they be sufficient adequately to teach technology? How will these tasks be assessed, and will their results be aggregated? Getting these right could be crucial to the subject."

The Council has also expressed concern that the range of courses proposed at Key Stage Four, in particular the short courses specialising in food could result in the separation of girls and boys, with the girls being tempted to take the food option and boys the more technical ones.

Increased Award

BRITAIN'S top award for innovation in engineering, the MacRobert Award, has had its prize money doubled to £50 000 from this year.

The Royal Academy of Engineering MacRobert Award, established in 1969, is given annually in recognition of the successful development and exploitation of an outstanding advance in any field of engineering. The Award is administered by the Royal Academy of Engineering with support from the Department of Trade and Industry.

Last year's winners, from BP, won their award for their advances in hydraulic fracturing. The closing date for entries for the 1993 award is 31 March.

Further details of the Award are available from the MacRobert Award Office, The Royal Academy of Engineering, 2 Little Smith Street, London SW1P 3DL. Tel: 071 222 2688.

Enhancing technology in schools

A TOTAL of £540 000 has been awarded to 27 schools in the UK to improve the teaching of technology.

Each of the 27 schools have received £10 000 from the Engineering Council's Technology Enhancement Programme, sponsored by the Gatsby Charitable Foundation, with a further £10 000 each from local funding partners, such as Training and Enterprise Council's, local education/business partnerships and local industry.

The programme aims to increase the capability of students between the ages of 14 and 19 in technology, maths and science through a more practical, vocational approach. There are plans to provide curriculum material and well-equipped rooms for up to 100 schools over a three year period.

Real-life problems are introduced into the classroom through links with local industry so that skills are learned to match those needs. The use of high quality materials, equipment and accommodation is encouraged to bring children's work closer to industrial standards.

The second phase of the programme, recently completed, refines and develops modules written in the first phase, the final aim being to develop modules of work which support GCSE and GNVQ courses in schools.

The first phase, in 1991-2, invited 13 schools to develop proposals for modules with the help of local industry.

The third and final phase will involve additional school trialling several modules within an accreditation framework.

March 1993

5th International Conference on Developments in Power System Protection
30 March—1 April, York. Details from IEE Conference Services, IEE Savoy Place, London WC2R 0BL. Tel: 071 240 1871 ext 222; fax: 071 240 7735.

Getting Started in Powder Technology
Continuing Education Course, 30 March — 2 April, Bradford. Details from Powder Advice, fax: 0274 589807.

April 1993

The Fundamentals of Air Dispersion Modelling for Environmental Assessment
Course, April, Cambridge. Details from Susie Reis, Cambridge Programme for Industry, 1 Trumpington Street, Cambridge CB2 1QA. Tel: 0223 302233; fax: 0223 301122.

Boiler Optimisation
Course, 1-2 April, Atlantic City, NJ, USA.
Details from the Association of Energy Engineers, 4025 Pleasantdale Road, Suite 420, Atlanta, GA 30340. Tel: 404 447 5083; fax: 404 446 3969.

The HVACR Industry in Europe
Conference, 7 April, Coventry. Details from Bob Wilkinson, Commercial Manager, FETA, Sterling House, 6 Furlong Road, Bourne End, Bucks SL8 5DG. Tel: 0628 531186.

Energy and the Environment in the South West
Regional conference, 13-15 April, Cornwall.
Details from Haydn Scholes, Conference Organiser, CSM Associates Ltd, Rosemanowes, Herniss, Penryn, Cornwall TR10 9DU. Tel: 0209 860141; fax: 0209 861013.

CICIND
Conference, 15-16 April, Edinburgh. Details from the Secretary, CICIND, 7 Malmains Close, Beckenham, Kent BR3 2SE. Tel: 081 663 3740; fax: 081 663 3741.

The Global LPG Business
Course, 18-22 April, Bahrain. Details from The Registrar, The College of Petroleum and Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD. Tel: 0865 250521; fax: 0865 791474.

Institute of Physics Annual Congress
Conference and exhibition, 19-22 April, Brighton.
Details from IOP Meetings Dept, 47 Belgrave Square London SW1X 8QX. Tel: 071 235 6111; fax: 071 259 6002.

Diesel particulates and NO_x emissions
Short Course, 19-23 April, Leeds Details from Miss Julie Charlton, Dept of Fuel and Energy, University of Leeds, Leeds LS2 9JT. Tel: 0532 332494; fax: 0532 440572.

Industrial Air Pollution Monitoring
Short course, 19-23 April, Leeds Details from Miss Julie Charlton, Dept of Fuel and Energy, University of Leeds LS2 9JT. Tel: 0532 332494; fax: 0532 440572.

Fuels for Power Generation
Seminar, 20 April, London. Details from the Institute of Energy, Conferences Dept, 18 Devonshire Street, London W1N 2AU. Tel: 071 580 0008; fax: 071 580 4420.

Artificial Intelligence in the Minerals Sector
Symposium, 20 April, Nottingham. Details from the Conference Office, The Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR. Tel: 071 580 3802; fax: 071 436 5388.

Analogue & Digital Interfacing of Transducers
Short Course, 20-21 April, Southampton. Details from Laura Brown, USITT, The University of Southampton, Highfield, Southampton SO9 5NH. Tel: 0703 593545; fax: 0703 592738.

Processtech '93
Conference, 20-22 April, London Details from Alison Elgar or Phil Woodford, IMechE, 1 Birdcage Walk, London SW1H 9JJ. Tel: 071 973 1281/1297.

Moscow International Oil & Gas Exhibition & Congress '93
20-23 April, Moscow. Details from Mark Webber, NEFTGAS '93, Byron House, 112A Shirland Road, London W9 2EQ. Tel:071 286 9720/266 1986; fax: 071 286 0177/586 2429.

Improving navigation for seismic acquisition and processing
Seismic '93, international conference, 22 April, London.
Details from Themedia Ltd, P O Box 2, Chipping Norton, Oxon OX7 5QX. Tel: 0608 84888/ 84700; fax: 0608 84796.

Human Factors in Nuclear Power
Conference, 22-23 April, London Details from Jane Worman, IBC Technical Services Ltd, tel: 071 637 4383; fax: 071 631 3214.

The Duty of Care
Conference, 22-23 April, London Details from Amanda Wright, IBC Technical Services Ltd, tel: 071 637 4383; fax: 071 631 3214

18th International Technical Conference on Coal Utilisation and Fuel Systems
26-29 April, Clearwater, Florida. Details from Coal Utilisation & Fuel Systems, Conference Organizing Committee, 1156 Fifteenth Street, N W, Suite 525, Washington DC, USA. Tel: 202 296 1133; fax: 202 223 3504.

Environmental Volunteering: a force for change
Conference, 27 April, London. Details from Pam Gill, The Volunteer Centre UK, 29 Lower King's Road, Berkhamsted, Herts HP4 2AB.

20th Idris Jones Lecture
By Jeremy Attree, 30 April, Cardiff. Details from Mr D H Mustoe, 20 Park Court Road, Bridgend, Mid Glamorgan CF31 4BW.

May 1993

Offshore Technology
25th annual conference, 3-6 May, Houston, Texas, USA. Details from: tel: (214) 952 9494; fax: (214) 952 9435.

Complying with environmental legislation
Short course, 10-11 May, Cambridge.
Details from: Elaine Hendry, Cambridge Programme for Industry, 1 Trumpington Street, Cambridge CB2 1QA. Tel: 0223 302233; fax: 0223 301122.

Low-rank fuels symposium
10-13 May, St Louis, Missouri, USA. Details from: 17th Biennial low-rank fuels symposium, University of North Dakota, Division of Continuing Education, Box 8277, University Station, Grand Forks ND 58202, USA.

Automation Days 93
Conference, seminars, lectures & exhibition, 11-13 May, Helsinki, Finland. Details from: Merja Huhtela-Sulku, tel: (+358-0) 1509 212.

CIMAC
20th international congress, 17-20 May, London. Details from: Conference Associates & Services Ltd — CIMAC, Congress House, 55 New Cavendish Street, London W1M 7RE.

Developments in nuclear emergency planning
Conference, 20-21 May, London. Details from Jane Worman, IBC Technical Services Ltd, tel: 071 637 4383

June 1993

Incineration Technology in Europe
Course, 23-25 June, Sunderland. Details from Dr Faisal Salam, tel: 091 515 2711; fax: 091 515 2741.

CONFERENCE PROGRAMME

• **Fuels For Power Generation**	London	20 April
• **Industrial Air Pollution Control: Are We Getting it Right?**	London	25 May
• **How Climate Change Will Change Your Business**	London	June
• ***International Symposium on* Combustion & Emissions Control**	Cardiff	21/22 Sept
• **Making Energy Privatisation Work — The Future of Regulation**	London	17 Nov
• ***2nd International Conference on* Ceramics in Energy Applications**	London	1994

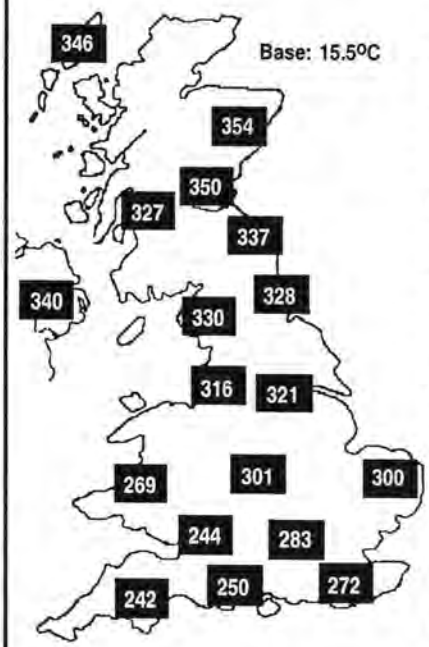
Events Co-Sponsored by The Institute of Energy:

First International Conference on Combined Cycle Power Generation
Calcutta, India, January 1994
General Enquiries should be directed to:
Professor Prabir Basu, Technical University of Nova Scotia, PO Box 1000, Halifax, Nova Scotia, Canada B3J 2X4, Tel: 1-902-420 7531
Paper Co-ordinator for the submission of abstracts from European Countries:
Dr J R Howard, Tel: 44-21-705 1946

For further details, contact:
Judith Higgins, Conference Manager, 18 Devonshire Street, London W1N 2AU
tel: 071 580 0008 fax: 071 580 4420

DEGREE DAYS: JANUARY 1993

Source: **Degree days direct**



These regional figures, calculated from daily outside air temperatures, provide an index of demand for space heating over the month and thus enable excessive consumption to be detected.

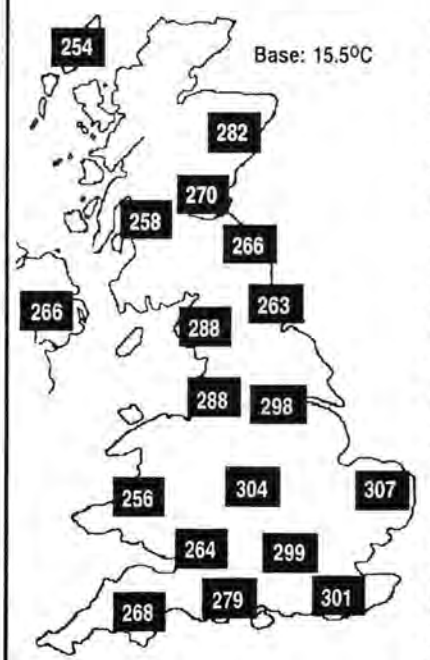
A well-controlled heating system should manifest a straight line relationship between monthly fuel used and the local degree-day value; any significant deviation from this 'target characteristic' is likely to signal the onset of avoidable waste (such as a stopped timeswitch or an open isolating valve).

Readers can get more information on the use of degree days from Vilnis Vesma, 17 Church Street, Newent, Glos GL18 1PU (0531-821350)

 Because different observing stations are used, the figures given here will not necessarily agree exactly with those from other information providers.

DEGREE DAYS: FEBRUARY 1993

Source: **Degree days direct**



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If you miss the tide of change now, you might get stranded later

If you are interested in energy management strategies geared to environmental protection, HANNOVER FAIR '93 is the place to find integrated concepts and state-of-the-art solutions. The display "Energy and the Environment" focuses on immediate measures aimed at reducing energy costs as well as processes and systems designed to ensure the cost-effective, environment-friendly use of resources in the long term. Energy-related technologies are presented at Hannover within an overall context. This presentation – which includes services for the energy sector and environmental protection – is enhanced by a variety of related displays.

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Electric Energy Technology	Energy and Environmental Technology
Installation Technology for Buildings	Lighting Technology
Plant Engineering and Industrial Materials	Tools and Factory Equipment
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21st – 28th APRIL

Further information: Arnold Rustemeyer, 25 Hurst Way, South Croydon, Surrey CR2 7AP, Tel.: (081) 6 88 95 41, Fax: (081) 6 81 00 69