July 1988: No 160

ENERGY WORLD

Published monthly by the Institute of Energy
18 Devonshire Street, London W1N 2AU
Telephones: *Editorial:* 01-580 0008. *Adminsitration:* 01-580 7124.
Membership, Education and Journal subscriptions: 01-580 0077.

Editor Sharon Dorrell BSc

The Institute of Energy is in association with:
The American Society of Mechanical Engineers
The Canadian Institute of Energy
L'Institut Francais de l'Energie (Paris)
The Fuel Society of Japan (Tokyo)
Verein Deutscher Ingenieure (VDI-Gesellschaft Energietechnik)
The Australian Institute of Energy

Printed by Headley Brothers Ltd, The Invicta Press, Ashford, Kent

Contents

Personal viewpoint

Belfast CHP

In assessing the role for combined heat and power (CHP) in Belfast and in the rest of Britain, the Government must ignore the report from the Belfast consortium if it contains the type of information which has been presented in the published summary report.*

Reading the summary report it would appear that previous work on CHP was not taken into account and the group did not understand the Government's energy papers 20, 35 and 53 which provided a basis for the calculation of energy savings achievable from CHP. Two full pages of diagrams in the summary report and some text pursue this issue. An arbitrary assumption about the relative demand at points of consumption for electricity and heat produces an arbitrary conclusion, considered important, that produces lower estimates for the savings from CHP.

The arithmetic is correct, but the assumptions are not, as a total CHP economy is postulated whereas in practice the reality is that CHP could provide only a very small proportion of the electricity generating capacity required and the methodology the report criticises as 'contrary to the belief of some enthusiasts for CHP/DH' is more robust.

Technically and economically it is difficult to see that the most economic scheme for Belfast was devised as other assumptions are presented in the summary report.

It would appear that it was assumed without question that an expensive type of heat meter would be used whereas earlier government work had shown the economics of such metering to be dubious as the incremental cost of CHP heat is low which may warrant less accurate, but cheaper, water metering.

A further page is devoted to a diagram which shows the technical assumptions for the scheme. It was assumed that three stages of heat exchange would be used — the first in the power station (flow

(Continued overleaf)

**CHP: the Belfast case,* summary report. Available from: Joint Venture for Belfast CHP, 54 Botanic Avenue, Belfast BT7 1JR

Are *you* missing out on the Journal?

The *Journal of the Institute of Energy* is published quarterly and is optionally available to members of the Institute of Energy wishing to receive it. (To those outside of membership it is available on subscription jointly with *Energy World:* price £102.00.)

Authors and titles of papers published in the *JInstE*, March and June issues respectively are:

March issue

DR S A BELTAGUI and DR N R L MACCALLUM: *Characteristics of enclosed swirl flames with peripheral fuel injection*

S G DAWES, DR G B GIBBS and J HIGHLEY: *The British Coal/CEGB project on pressurised fluidised bed combustion*

DR P N WILD, DR F BOYSAN and PROF J SWITHENBANK: *Spray combustor modelling*

DR S E ALY: *Reverse osmosis desalination by waste heat absorption power cycle*

DR A M GODRIDGE: *Flue gas recirculation in oil-fired plant*

DR G J LYONS, H P POLLOCK and A HEGARTY: *Communication — Fuel properties of short-rotation hardwood coppice sprouts*

June issue

A R BUTT, C J BOWER, R C GREEN, DR N P PATTERSON and J J GALE: *Coal-fired appliances for process heating*

DR W P HUTNY, DR J C Y WANG and G K LEE: *Stability of natural gas and coke oven gas flames in a cylindrical furnace*

D A COOPER: *The influence of ammonia and hydrogen peroxide addition on NO emissions in the glue gas channel of a 16 MW coal-fired fluidised bed combustor*

A SUTHENTHIRAN, S A KHAN, DR S H AHMED and DR M D CARABINE: *The influence of high temperature and residence time on the formation of SO_3 in a premixed laminar flame*

J H BROMLY, F J BARNES and DR L H LITTLE: *The effect of low levels of CO, H_2 and hydrocarbons on NO_2/NO ratios in heated gases*

DR J S DENNIS and DR A N HAYHURST: *A model for the continuous desulphurisation of a fluidised bed combustor using limestones, dolomites or related solid sorbents*

DR O OGUNSOLA and DR J J RUETHER: *NO and smoke emission characteristics of coal-derived liquid fuels fired in a process furnace*

To Publications Dept, Institute of Energy
18 Devonshire Street, London W1N 2AU

I would like to receive the March issue.
I would like to receive the June issue.
I would like to receive future issues of the Journal.
(delete as applicable)

Please send to:

Name..... Prof/Dr/Mr/Ms

Address.....

.....

.....

Belfast CHP *continued*

120°C 70°C return) secondly an intermediate heat exchanger flows 120°C 95°C returns 70°C 55°C, thirdly, heat exchangers in each consumer's premises to provide the central heating.

The intermediate heat exchanger stage serves no purpose and results not only in larger pipe sizes than are necessary and a more complex distribution network, but also results in lower performance of the combined heat and power plant itself which will result in higher costs of heat and a less economic scheme.

The Government spent £250 000 of public money on this report and it should make the full report available to refute such simplistic criticisms, no doubt all incorrect, based on the summary.

CHP has an economic potential similar to nuclear power without the environmental and political risks. CHP's ability to significantly reduce the demands for fossil fuel and reduced pollution levels provides many of the attributes that are government reasons for giving nuclear power a special place in its privatisation proposals.

Since CHP effectively displaces the burning of fossil fuel to heat buildings it should be defined as a non-fossil activity and electricity privatisation legislation should place CHP in the same group as nuclear power and other renewables.

Area board plcs should be encouraged to invest in a city-wide hot water grid, a benign long-term technology that could do much for inner city redevelopment. The choice for heating London long term on the all electric route with no fossil fuels is 11 nuclear power stations, reduced to possibly seven if every building had electric heat pumps which would change the London climate. The CHP option would require four power stations. Such obvious advantages recognised in Europe and by the EEC must be recognised by government and CHP put back firmly as part of the national energy policy, since government is not allowing it to develop through market forces by giving nuclear a subsidised and preferred position.

WRH Orchard
Fellow

Competition in electricity?*

Prof Colin Robinson†

There are a number of good features in the Government's proposals for privatising the electricity supply industry: the CEGB is to be split, transmission is to be separated from generation, the obligation to supply is to be transferred solely to distributors and there are to be penalties for poor service. Nevertheless, these good points are overshadowed by the Government's failure to establish the conditions for effective competition in generation. The duopoly which is to replace the CEGB and the obligation on the major generator to promote nuclear power will almost certainly restrict competition so that an impossible burden will be placed on a regulatory body attempting to protect consumers. Distributor control of both the electricity transmission and the distribution networks may also constrain competition, as may the ability of distributors to generate. Another unfortunate feature of the proposals is that, if implemented, the only form of coal privatisation which seems possible will be as a monopoly. The White Paper is, however, only an outline: for instance, it lacks any details of the regulatory system. As more thought is given to electricity privatisation, the Government's views may evolve towards the injection of more competition. The principal needs are to establish more generators from the outset, to form a separate nuclear company and to introduce new management into the industry. A liberal form of coal privatisation would then be possible

The Government's intention to privatise electricity supply was first announced in the Conservative Party Manifesto, *The next moves forward*, of May 1987 which stated that 'we will bring forward proposals for privatising the electricity industry subject to proper regulation'. There was another, potentially inconsistent, commitment in the manifesto, to 'developing abundant, low-cost supplies of nuclear electricity', which was clearly likely to cause difficulties in the formulation of a privatisation plan.

In the summer of 1987, in the immediate aftermath of a sweeping election victory, the Government evidently believed that it would be able to make a decision in principle on the form of privatisation by the early autumn. But, as awareness grew of the complications of privatising the industry, the decision date moved back to the spring of 1988. Eventually, after details of the proposals were 'leaked' in the *Financial Times* on 4 February 1988, a White Paper from the Department of Energy (Cm 322) on the scheme for England and Wales was published on 25 February; Scottish Office proposals for Scotland followed on 2 March (Cm327). This IEA (Institute of Economic Affairs) inquiry is concerned particularly with the scheme for England and Wales, though it deals briefly with the proposals for Scotland.

*Presented to the Institute of Chartered Secretaries and Administrators at the University of Surrey on 5 May 1988. The lecture is published here by courtesy of the Institute of Economic Affairs

†Professor of Economics, University of Surrey

The decisionmaking procedure

The procedure adopted in devising the privatisation scheme is worth comment. As no Green Paper was issued and the Commons Select Committee on Energy was formed too late to influence the contents of the White Papers, there was little public debate to provide the Government with a factual and intellectual base for its eventual decision about changing the structure of a rather complex industry. Naturally, industrial organsiations made vigorous representations because the impact of any scheme would fall most directly on them. A number of papers were written by outside commentators about electricity privatisation,[1] there were conferences[2] and no doubt many documents circulated within Whitehall. It is true also that interested parties and outside commentators had discussions with ministers and officials. But since, before the White Papers, it was unclear what alternatives were being considered by government, those discussions were by no means as fruitful as they might have been.

Whatever one thinks of the proposals which eventually emerged, the procedure adopted was extremely unsatisfactory. Only now, *after* the appearance of the White Papers can any really informed public debate begin. For that reason, it is important that the Government should still be prepared to listen. There are many gaps in the schemes as proposed; they need to be filled and, as they are, it is desirable that the proposals themselves should change in a number of ways if the Government's stated objectives are to be achieved.

(Continued overleaf)

Background to the proposals

Formulation of a privatisation plan for the electricity supply industry (ESI) took place against a background of increasing dissatisfaction with the previous energy privatisation scheme, that for British Gas, which had been transferred into the private sector with is monopoly powers virtually undisturbed.[3] When ESI privatisation was under discussion, there was no sign of emergent competition in the gas market; indeed, in November 1987 (less than a year after flotation) British Gas' pricing and other contractual arrangements with large industrial consumers were referred to the Monopolies and Mergers Commission. After such an experience, it seemed likely that the Government would transfer another energy monopoly intact into the private sector. The Secretary of State for Energy on several occasions made plain that he wanted to establish competition in those parts of the industry which it could reach (principally generation, rather than the natural monopolies of transmission and distribution). However, the question was would there be genuine competition in electricity supply or would there merely be some token gestures in that direction. Even after the appearance of the White Paper, the answer to that question is still not clear. The *appearance* of competition in generation is certainly there; whether it will be translated into reality is less certain.

The proposals in outline

According to the White Paper the Central Electricity Generating Board (CEGB), which has been the dominant force in the nationalised industry in England and Wales, is to be split into three parts. Two large private generating companies are to be formed from the Board. One (G-major, for short) is to have about 70% of existing capacity including all nuclear stations; G-minor will have the other 30%, 'including a broad spread of coal, oil and gas turbine plant of various sizes and ages'. It is intended that G-major and G-minor will compete, using existing plant, to supply distributors and large consumers; they are also supposed to tender competitively 'for contracts with distributors to build new capacity'. The White Paper does not express the relative sizes of G-major and G-minor in terms of non-nuclear plant: by the time of privatisation, however, they will probably have roughly 60:40 shares.

A potentially very significant change concerns the third part of the CEGB; the National Grid, which the Generating Board lobbied very hard to retain. Despite that lobbying, ownership and control of the grid (including the two Welsh pumped storage stations and the interconnectors which permit imports of electricity to England and Wales from Scotland and France) will pass to the electricity distribution companies. Thus there will no longer be generator control of electricity transmission, of the 'merit order' which operates power stations roughly in order of short run avoidable cost and of electricity imports.

The third part of the industry, distribution, is, on the face of it, the least affected by change. There are to be 12 private distribution companies, according to the White Paper 'based on the existing Area Boards'. However, it would be incorrect to conclude that privatisation will have little impact on distribution. The new distributors will have a vastly expanded range of functions to perform. In addition to control of the grid, they will be able to generate electricity themselves 'where this does not create local monopolies in the production and supply of electricity': according to newspaper reports, it is likely that they will be permitted to generate up to 20% of their power requirements. They will also be entrusted with the 'obligation to supply' (presently shared with the CEGB which has the main responsibility).

Furthermore, the relationship of distributors to generators will change fundamentally. At present, the area boards can do little to influence the terms of supply from the CEGB; they receive power from the CEGB at the bulk supply tariff and pass the costs onto largely captive consumers. Such a passive role will no longer be enough: the distribution companies will have to negotiate power contracts either with British generators or with Scotland and France.

Government intervention in the industry will continue, despite privatisation. In an attempt to improve security of fuel supply, there will be statutory requirement on the distributors to contract for a minimum proportion of supplies from non-fossil fuel sources; the Government will fix the proportion at what is 'achievable at the time of privatisation' and will be able to vary it thereafter. In practice, the distributors are likely to be able to reach their specified proportion mainly through contracts with G-major for nuclear power, though they might also import nuclear electricity from France and Scotland and take some power from 'renewable' sources.

A Director-General of Electricity Supply will supervise regulation of the industry under a regime, yet to be specified, designed 'to safeguard the interests of customers and to promote competition in the industry'. Generation as well as the natural monopoly sectors of the industry is to be regulated 'initially, although the burden of regulation should diminish as competition in generation increases'. The White Paper says very little about the form of regulation which, following recent British practice, is apparently to be based on price control rather than rate of return regulation. There is to be 'detailed consultation with the industry' on the 'complex' issues involved in 'constructing an effective regime'. Another important duty of the Director-General will be to set guaranteed standards of service to consumers; distributors which fail to meet these standards will have to pay compensation to their customers.

In Scotland the two vertically integrated Boards are to be privatised as separate entities though with some potentially significant changes. The South of Scotland Electricity Board (SSEB), which supplies about three-quarters of the electricity consumed in Scotland, has had more success in building and operating nuclear plant than the CEGB and has a much higher nuclear component of total supplies; indeed, once the new Torness advanced gas cooled reactor (AGR) is commissioned, about 50% of Scottish electricity supplies will be from nuclear stations. In England and Wales the corresponding proportion is at present about 16%; it will increase with the full entry into service of the AGRs now being commissioned but probably remain in the range 15 to 20% in the 1990s as, first, the early Magnox reactors are closed and then the Sizewell pressurised water reactor (PWR) is completed. The Scottish nuclear stations are to be jointly owned by the SSEB and the smaller North of Scotland Hydro Electric Board (NSHEB).

A 'modest' re-allocation of conventional generating plant as between SSEB and NSHEB is proposed, presumably so that SSEB does not dominate its

smaller neighbour. The Government also wants the joint generating agreement between the two Boards to end. It hopes that the two companies will compete both to supply large industrial consumers and to export to England and Wales from the considerable surplus generating capacity. 'Yardstick' competition will also be possible by means of performance comparisons between the two boards, though they differ so much in terms of size, power sources and consumer characteristics that conclusions will be hard to draw.

An overview

The Government's proposals for electricity supply are undoubtedly a significant improvement on the hastily-conceived and ill-advised privatisation scheme for British Gas. In gas no attempt was made to separate the natural monopoly sectors of the industry, where regulation is needed, from those where competition could have been introduced as the principal safeguard for consumers. At least, such a basic error has been avoided in electricity supply.

The electricity proposals are clearly directed at introducing competition into generation which is the prime candidate for liberalisation and to that extent they should be welcomed. The White Paper's general switch of emphasis towards distribution and away from generation (which for so long has dominated the ESI) is also plainly a move in the right direction. For example, under the new regime distributors, who are the sector of the industry closest to consumers, will have the sole obligation to supply those consumers. The proposals to make distributors pay compensation to customers for poor service also seem well-directed since natural monopolies subject to price regulation are often tempted to reduce the quality of service they offer.

Doubts about the White Paper scheme relate principally to the extent to which competition in generation is actually likely to emerge in the foreseeable future under the proposed structure. The Government relies very heavily on the presence of an independent grid to stimulate competition. However, the grid will not be truly independent: it will be distributor-controlled and that is a significant difference. In any case, though taking control of the grid away from the generator is clearly one of the necessary conditions for competition to appear it is by no means sufficient. Unless the structure of the generation sector is such as to establish, maintain and encourage competition the availability of a grid outside generator control is essentially an irrelevance in determining whether competition will emerge: by definition it cannot do so if there are no competitors. Doubts about whether the proposed structure of generation is adequate to provide competition are strengthened by the White Paper's own statement (*The proposals in outline,* above) that there will need to be initial regulation of generation (as well as the natural monopoly sectors of distribution and transmission) which suggests the Government itself lacks confidence that significant competition will appear in the foreseeable future.

Competing generators?

In assessing the White Paper's proposals, the key issue to consider is whether or not the new structure is likely to promote competition in generation. The plan is, in essence, to establish a duopoly initially but to provide conditions which, it is hoped, will encourage other generators subsequently to come into the market. In a number of papers written before publication of the White Paper,[4] Allan Sykes and I explained the unsatisfactory nature of duopoly in generation and of proposals to 'grow competition' gradually over a period of time. Briefly, the reasons for doubting whether the scheme as proposed is capable of injecting significant competition in the foreseeable future are as follows:

■ There is always a strong incentive to collude (either explicitly or implicitly) in duopoly since, by suppressing competition, both companies can gain at the consumers' expense. Because the market demand for electricity is highly inelastic with respect to price (in almost two thirds of its uses there is no close substitute), two very large generators acting in concert can each be much better off than if they indulge in price competition. Of course, they may well choose not to make large profits because to do so would make them conspicuous; a quiet life at the consumers' expense is a more likely outcome. The danger of collusion is clearly increased by the common managerial origins of G-major and G-minor. They would not be companies which had grown up separately and had some experience of competition. Nor would one of them be, like Mercury in telecommunications, a new company formed with the specific aim of competing with an established monopolist.

■ The decision to entrust G-major with existing nuclear stations and with the future nuclear programme is likely to have unfortunate effects and, in general, will constrain competition. Existing nuclear capacity and future nuclear stations built at government behest will have a more or less captive market in distributors which have to achieve their specified proportion of non-fossil fuel electricity. Plainly, despite the White Paper's insistence that the privatised industry will be free from government interference and protected from 'fluctuating political pressures', government will have the power to insist that distributors take such quantities of non fossil fuel energy as it wishes. Moreover, there are bound to be suspicions about the subsidisation of nuclear power and about political fixes between the Government and G-major; the latter will not be regarded by anyone (least of all by G-minor) as a straightforward commercial competitor. G-major itself will suffer from the same confusion of management objectives which has been common in British nationalised industries in the past; it will not know whether it is supposed to be pursuing commercial or 'public service' objectives. One of the advantages of privatisation is supposed to be that it avoids such confusion. However, in practice G-major will not have been genuinely privatised if the White Paper is put into effect since one of its roles will be to act as an instrument of government policy.

Any scheme which, for ill-defined reasons, tries to promote a particular form of energy by placing it apparently in the hands of a private company but actually controlling it by government is bound to face such problems. As explained below, if the Government insists on promoting nuclear power, it would be better advised to do so via a separate company.

■ The mechanics of dividing the CEGB are entirely unclear nor is it known who will make the division (though presumably it will not be the existing CEGB). However, that the division is made will influence the degree of competition which results. If one generating company appears less attractive than the other (perhaps G-major, because of the greater potential for

government interference) it is unclear how staff are to be made to join the less-favoured organisation. The chances must be that, if the White Paper proposals are put into effect, one company will start off with a significant managerial deficiency compared with the other. A possible consequence is that, instead of collusion between two organisations with similar power, one generator will come to dominate the other so that there is, in effect, continued monopoly in generation.

■ The White Paper seems to envisage competition growing over time. It may be that imports from Scotland (where surplus capacity will increase) and France will rise though it was not necessary to privatise in order to achieve that: the Government could have insisted on increased imports whilst keeping the industry nationalised. Whether any major competition for G-major and G-minor will develop from new private generators is much more doubtful. Those two companies will most likely obtain their assets at substantially below replacement cost. They will have systems comprising a mix of power stations against which potential entrants to the industry will have to compete with a single power station. Furthermore, it will be extremely difficult by regulation to prevent the two Gs from predatory pricing. They will be able to cross-subsidise when quoting for power supplies from existing stations or from plant to be constructed. Moreover, as argued above, they may well either collude or one will dominate the other. In the circumstances, competitors will be very wary of entering the industry; some potential entrants, such as the power plant manufacturers which for years have been supported by the CEGB's 'Buy British' policy, may well be deterred by continuing dependence on the two Gs for a large part of their business. No doubt some electricity distributors will use their new-found power to build and operate generating plant, though it is less clear whether that will benefit consumers. The distributors will have local monopolies and, despite the regulator, it will be hard to establish whether any plant they build is genuinely competitive or whether it is designed to satisfy managerial objectives such as expanding the size and the scope of their activities.

■ The White Paper exaggerates the likely extent of new entry. It says that over 70% of CEGB capacity is at least 15 years old (though the relevance of 15 years is not obvious since coal plant is expected to remain in operation for 40 years) and that the CEGB 'currently predicts a need for some 13 GW of new plant to be commissioned by 2000'. It fails to mention that, on present plans (which may well be excessive anyway) only some eight or nine gigawatts of additional plant is likely to be fossil fuel, which is where any new competition will be since nuclear plant is reserved for G-major. Eight or nine gigawatts is only about 10% of likely installed generating capacity in Britain in the early years of next century. In any case, for the reasons given above, the two Gs will probably take the bulk of new capacity. Thus the chances of a rapid infusion of new competition seem very low.

The fundamental weakness of the White Paper lies in the proposals for generation. Although implementing these proposals will cause a great deal of disruption, there is only a low probability that any significant competition will emerge in the foreseeable future. In other words there will be all the costs of a more thorough-going structural change which established workable competition from the beginning; such as one which broke the CEGB into five or six competing generators. But a scheme which splits a monopoly into a duopoly and then relies on new entrants being able to fight their way into the market against these strong incumbents, may well be incapable of realising any of the benefits which one would expect a competitive market to provide. Although the Government deserves credit for deciding to split the CEGB, the division that it is making will probably accomplish little. Once the decision to divide had been made, there would surely have been no greater political problems in dividing into five or six than into two.

Nuclear power and security of supply

The manifesto commitment to nuclear power sits uneasily with the apparent wish to place decision-making in the ESI in private hands and to give more free choice of fuels to generators. If left to the market, existing nuclear stations in England and Wales would most likely be left unsold and no new stations would be built for the time being. But, it wishes to privatise the ESI, the Government also wishes to have a nuclear programme. Thus it has decided to over-ride the market in the case of nuclear power.

Circumstances in which, in principle, social gains can be made by over-riding the market are quite common although in practice there is no guarantee that political and bureaucratic action will realise those gains. In the case of nuclear power, however, it is not even clear that there are, at first sight, arguments for displacing market decisionmaking. If there is a case, the Government seems remarkably reluctant to make it. The White Paper relies on general expressions of the need for security of energy supply rather than making a specific case for nuclear power. Indeed, the security arguments now being made for nuclear power are uncomfortably reminiscent of the way in which coal protection was justified for so many years.[5] From the late 1950s onwards, successive British governments used rather vague security reasons as their main justification for the heavy protection of British coal. The error of those ways has been, belatedly, recognised, but it seems that the logical conclusions has not yet been drawn. Supporting coal actually provided the British economy with insecurity of fuel supply by boosting the industry's monopoly power.

Briefly, the main problems with the Government's approach are as follows. Let us suppose, for the sake of argument, that security of fuel supply can be enhanced by having some proportion of power supplied from nuclear stations. Then there will be an 'external' benefit associated with nuclear power. But that, in itself, is no argument for supporting nuclear power. One would have to do a full-scale cost-benefit analysis of nuclear power which estimated external costs as well as external benefits before such support could be justified as offering a net social benefit. Plainly, there are great difficulties in making such estimates. But unless the Government can show that it has made the attempt, it is in no position to claim that there are social reasons for over-riding the market in this case.

There is, anyway, room for doubt about the security case. In general, security of fuel supplies is promoted by having a diversified portfolio of sources of supply[6] which protects against short-term interruptions or long-run increases in the price of one source. Thus, despite the common view that foreigners are not to be trusted with Britain's fuel supplies, imports of coal and natural gas (which have both been restricted in the

past) are means of providing diversity and security. Liberalising markets generally promotes security because, instead of dependence on a monopoly, there are several suppliers. The principal problem in using nuclear power as a means of security provision is that, as has been shown by reaction to the two serious civil nuclear accidents of the last 10 years, an accident in another country inevitably has a spill-over effect. The nuclear technocracy may regard people's fears of nuclear accident as a product of ignorance, but those fears exist. Consequently, an accident in another country — even with an unrelated reactor type — is capable of adversely affecting nuclear power in Britain: future binding might be deferred, there might be pressure to shut down or de-rate some existing capacity, and stricter regulatory requirements might lead to much increased costs. Whether nuclear power can, in such circumstances, genuinely be regarded as a means of security provision is doubtful. Probably there is a case for having a nuclear element in generating capacity. But it is not obvious that, for security reasons, there should for the time being be any addition to the 15 to 20% of electricity which in any case will be generated from nuclear sources in England and Wales in the 1990s.

Furthermore, if the Government is insistent that the market should be displaced in the case of nuclear power, the method it has chosen is inappropriate. Placing nuclear power in the hands of G-major is likely to lead to continued substantial government interference in electricity generation, cause suspicions that nuclear power is being over-subsidised and bring about confusion in managerial objectives in G-major. If the idea is to bury away nuclear power within G-major it is very unlikely to work: prospective investors in that company will want details of likely decommisioning costs and how insurance and compensation claims are to be handled.

The best one can say about the form of organisation proposed is that it may be no worse than nationalisation; distributors at present have no option but to accept whatever fuel choice the CEGB makes (often under government pressure) and to pass the costs on to consumers. However, privatisation should accomplish more than a reshuffling of responsibilities which leads to minimal real change. It would be far better, if the Government must have a nuclear programme, to place it (and existing stations) in the hands of a separate company. The costs of nuclear power, including the degree of state support, would then be clearer and G-major would have more strictly commercial objectives. Even if nothing else were done, G-major might at least be more motivated to compete. The Government evidently has no objection in principle to a separate nuclear company since that, in effect, is what it proposes in Scotland where nuclear stations will be jointly owned by the SSEB and NSHEB, the White Paper on Scottish electricity names a 'joint nuclear subsidiary' as one of the possible ways of achieving such joint ownership.

The relationships between generators, transmission and distribution

According to the White Paper, the new distributor-owned grid company will work in 'much the same way as the CEGB's National Grid Control and Transmission Division operate at present'. That is, it will operate the merit order, ensure the technical stability of the system and be responsible for the technical quality of supply. An important difference from the existing regime is that the new company will have contractual relationships with the generating and distribution companies instead of the cooperative-type relationships which exist now within the ESI.

Two forms of contractual arrangement are envisaged in the White Paper. One is direct contracts between the distributors (jointly or severally) and generators; the grid company will be involved as necessary to ensure that the transmission system can accept proposed capacity additions and to agree connection and transmission charges. The other is for distributors to contract for electricity with the grid company which, in turn, contracts for capacity and supplies.

Although, under the Government's proposals, the grid company is taken out of the hands of the generator, placing it in the hands of distributors may raise problems of its own. Both long-distance transmission and local distribution of electricity are natural monopoly activities with present technology. Consequently a great deal of market power will be placed in the hands of the distributors if they control both of these activities. The Government's objective is laudable enough. It has recognised that generator control of electricity transmission is likely to lead to the exclusion of new generators, and it wants to place grid control nearer to the consumer. But distributors are only the agents of consumers and in some circumstances, they might act against consumer interests. For example, a particular distributor might not wish to allow private generators access to its distribution system: the distributor might have generating capacity of its own with which new entrants would compete or, even in the absence of distributor-owned generation, entrants might wish to use the local network to supply large consumers previously taking their supplies from the distributor. Distributors might also act to prevent private generators moving electricity across the boundaries of different distribution boards.

The possibility of distributors erecting entry barriers reinforces the need to make the initial structure of generation as competitive as possible rather than relying on entry to establish and maintain competition. It suggests also that it would be wise to drop the White Paper provision that would allow distributors a degree of vertical integration by allowing them to generate a proportion of their own electricity needs. The provision that such generation will be allowable where it does not 'create local monopolies' will be very difficult for the regulator to interpret and enforce.

Some of the differences in interests between distributors and consumers are recognised in the White Paper which promises to review the terms of the 1983 Energy Act (which has had no success in stimulating private generation). If the Government's scheme is implemented, there will be heavy reliance on the regulator to ensure open access to the transmission and distribution systems. Given the natural monopoly characteristics of transmission and distribution, such reliance is to an extent inevitable but placing the whole electricity transportation system in the same hands seems designed to make the regulator's task unnecessarily difficult. A better alternative would have been to have established a separate 'common carriage' transportation company, owning not only long-distance transmission but also much of the local distribution networks — which had no vested interests in excluding potential generators. *(Continued overleaf)*

The second form of contractual relationship which is proposed also seems undesirable. If a distributor-owned grid company were to act as sole intermediary between generators and distributors it could clearly turn into a very powerful 'market maker'. For dominance by a sole generator would be substituted dominance by a powerful grid company backed by distributors. The grid company should be confined to common carriage type activities. Electricity market-makers will appear as a result of market incentives if there is a function for them to perform and they will compete one with another. It is not desirable for the state to encourage a market-making monopoly in electricity run by organisations which already have monopolies of transmission and distribution.

Managing the distributors

Under the White Paper proposals the new distributors will have many functions to perform of which so far they have no experience. Yet there is no indication that they will be provided with any new management. If the Government intends to hand over to the existing organisations such functions as negotiating and implementing long-term power contracts both with British and overseas suppliers problems seem bound to arise. What is more, potential investors will recognise that the track records of the present area boards are barely relevant in judging the future prospects of the distributors because they will be working in such a different environment: the proceeds of sale will inevitably be depressed by reservations about management ability and consequent uncertainty about what the distributors are worth.

Managers are the agents of consumers so it is essential that they should be experienced and capable of negotiating effectively on their customers' behalf. Moreover, new management needs to be provided as soon as possible because the various novel tasks will have to be performed as soon as the distributors are privatised. One way of bringing in new management quickly would be to allow corporate investors to take stakes in the distributors along lines originally suggested by Allen Sykes and Tony Merrett.[7]

Regulation

If the Government's scheme is implemented, an enormous weight will be thrown on the regulator. Yet the White Paper is almost silent on the details of the regulatory regime. In a sense, we still know little about the Govenment's intentions towards electricity supply since it has said so little about this crucial element of its proposals. It is, of course, not good enough to suggest a structure and then attempt to meet all criticisms by saying that they are matters to be left to the regulator. Experience elsewhere shows that regulation is a very unsatisfactory business.

The Director-General of Electricity Supply will be confronted by an initial structure which includes a possibly collusive duopoly in generation (with one company partly an instrument of government nuclear policy), distributors that are allowed to generate and a transmission company owned by the distributors. Moreover, both the coal industry and the heavy electrical plant manufacturers, that will presumably be substantial suppliers of fuel and equipment to the industry, have for many years been supported by the CEGB from which the two Gs will be formed. This interlocking network of relationships, in an industry structure which seems unlikely to encourage competition, is bound to make the regulator's task extremely difficult, if not downright impossible. The root of the regulatory problem, if ESI privatisation follows the White Paper scheme, will be the failure to establish an initial structure of generation which is clearly likely to stimulate competition. A competitive generation sector would bring about downward pressure on costs and prices; generation would then only need to be supervised, as in any other industry, to ensure that competition was preserved. Regulation could, in such circumstances, concentrate on making sure that the way in which the transmission and distribution sectors operated allowed gains to be passed on to consumers in terms of lower prices without loss of service.

It is possible that the regulator will be 'captured' by the industry; after all, if the White Paper scheme is implemented G-major and G-minor will between them retain a near-monopoly of information about electricity generation in Britain. Alternatively, the regulator might become the most powerful figure in the industry because so many decisions will be left to him or her; in the absence of competitive standards there will inevitably be a large arbitrary element in such decisionmaking. Neither situation represents a clear improvement as compared with continued nationalisation which is itself a form of regulation performed by politicians and civil servants; it has worked poorly, but it might be no worse than regulatory capture or complete regulatory control of decisionmaking.

What form of price regulation the Government has in mind is unclear. It will be extremely hard to combine it with the flexible pricing system which is required if electricity consumers and producers are to receive market-place signals that will induce productive and allocative efficiency in electricity supply. One danger is that regulation will apply indefinitely to the whole ESI and will merely produce a variant of the present cost-plus regime. That is another reason for suspecting that there may be no benefits to offset against the costs of change if the White Paper is implemented.

Regulation and flotation

Selling the ESI to private shareholders is likely to be a difficult task, so long as memories last of the stock market crash of October 1987. Although no one expects the proceeds of sale to be anything like the £45 billion or so replacement value of assets for the ESI in Britain, most estimates are in the region of £15 to £20 billion.[8] A recent valuation of the CEGB is in C W Hope, Cambridge University Engineering Department Research Paper 4/87.

The proceeds of sale and the ease with which it can be made will depend partly on the regulatory regime. An awkward dilemma will confront the Government. If it is true that the structure will stimulate little competition, relatively 'heavy' regulation will be required to try to safeguard consumers against the exercise of monopoly power. But the prospect of heavy regulation under an untried regime will make it extremely hard to sell shares in the industry. No doubt the City would much prefer light regulation under some simplified formula of the RPI – X + Y type applied to British Gas sales to smaller consumers, though such a formula would seem quite inappropriate for a complex, capital-intensive industry such as the ESI where costs vary significantly, for example, by time of day and by season of year.

The impact on coal

One particularly important issue which the Government has yet to address is the impact of ESI privatisation on the coal industry. For many years one of the principal means of coal protection in Britain has been to coerce the ESI into taking almost all of its supplies from British Coal, limiting imports and coal from the small private sector in Britain. Since 1979, the CEGB and British Coal have had collusive agreements ('joint understandings') which have not been strenuously resisted by the ESI because the industry's market power allowed the costs to be passed on to consumers. According to the White Paper, nuclear power is to be protected. It is not clear yet whether there is to be no protection at all for British Coal via electricity generation, though statements by ministers and recent attempts by the SSEB to replace British Coal supplies by imports seem to imply that generators expect to be free to import coal after privatisation.

Freeing imports is to be welcomed as a belated conversion to an action many of us have urged for years. However, it would be unfortunate if no accompanying moves were made to liberalise coal mining in Britain. The restrictions on private sector mining need to be lifted and existing mines sold off to bring new ideas and greater entrepreneurship into the industry.[9] If such actions are taken, there is a good prospect that a British coal industry little below its present size can be maintained in competition with imports.

Considering coal in the context of ESI privatisation, a particular problem is the near-monopoly of the British coal market which could well be the result of implementing the White Paper's proposals. If the two Gs dominate electricity generation, they will also dominate the coal market because of their buying power: at present about three-quarters of British coal sales are to power generation. That position of dominance would most likely be a major deterrent to potential investors in British coal mines. Moreover, the behaviours of both Gs would be subject to an untried regulatory regime as explained above. Potential investors in both coal and electricity would thus have to guess how the regime might operate over many years into the future. Perceived returns would be depressed by generator dominance and the perceived riskiness of the return would be increased by regulatory uncertainty.

Embarking on ESI privatisation without thinking carefully about coal liberalisation and privatisation is a most dangerous procedure which could predetermine the form in which coal can eventually be privatised. The Government needs to have some idea of its aim for the two industries. A reasonable liberal-type objective would, for example, be to establish a generation industry and a coal industry within each of which there was competitive rivalry and between which there was bargaining among a number of suppliers and customers. There would also be actual and potential competition from imports of coal and electricity. Given such markets, with neither industry dominating the other, there would be downward pressure on costs, consumers' interests would be safeguarded by the force of competition (imperfect though it would be) and there would be the other social benefits associated with liberalisation.

If, instead, the Government establishes a privatised ESI which dominates the British coal industry it will simply not be possible to realise such benefits. The only way coal could be privatised would be as a monopoly. Investors would be unwilling to sink money into pits in competition one with another for the business of a near-monopolist. Thus if the Government goes ahead with its ESI proposals, it is by no means fanciful to foresee a situation in the mid-1990s in which three private energy monopolies, gas, electricity and coal, have replaced the state monopolies we know or have known so well.

Conclusions

Making an overall judgment on a White Paper which is a mixture of the good, the bad and the unspecified is difficult. The good features are removal of the grid from generator control, transfer of the obligation to supply to distributors and provision of penalties for poor service.

Breaking up generation would be a good idea too, if it were done properly. But the proposed structure of generation seems unlikely to induce any significant amount of competition. Nuclear-generated electricity is to be protected from competition, and to that extent will be an unfair competitor for coal, for reasons which are not justified in the White Paper. Furthermore, inclusion of nuclear stations within G-major seems bound to cause problems, including confusion of managerial objectives. The grid, though separated from generation, will not really be independent but under distributor control; distributors (with the right to generate themselves) may erect barriers to the entry of other generators. Since so little competition in generation is likely, the whole industry will probably have to be regulated. Yet the regulatory system is unspecified. Nor is there any indication that the Government has thought through the impact on coal; it is quite likely that if the White Paper scheme is pursued there will be no alternative but private monopoly when it comes to coal privatisation.

The White Paper is a useful step forward provided it is not regarded as the definitive work on electricity privatisation but as an intermediate stage which needs to be developed further into a proposal capable of bringing genuine benefits. The key is to establish an initial structure of generation which offers a real prospect of competition; unless that is done, there is little point in proceeding with privatisation. Some suggestions that could be used to build on the White Paper's proposals are as follows:

- establish a larger number of major generators from the outset, splitting the present CEGB into (say) four to six fossil fuel generators and a separate nuclear company
- permit corporate investors to take shares in the generators to ease flotation and to introduce new management.
- bring new management into distribution (where there will be a pressing need for it), perhaps also by introducing corporate investors
- investigate franchising in distribution as an alternative to price regulation, perhaps by giving corporate investors' stakes in distribution subject to satisfactory performance.[10]
- establish an electricity transportation company independent of distributors

With such changes there is a reasonable prospect of achieving a liberal form of privatisation that would benefit consumers. There should be competition in generation, distribution would become more efficient, the regulator would have a manageable task and it would be possible to privatise coal in a way that also

(Continued overleaf)

Conference report 1

Engineering for profit from waste

The conference, held on 15–16 March 1988 in Coventry, was organised by the Institution of Mechanical Engineers with the Institute of Energy and others in association. Under the title 'Engineering for Profit from Waste' it covered two aspects of waste disposal, the extraction of landfill gas and its use as a fuel and the recovery of energy from waste by combustion.

Introductory papers concentrated on the theoretical financial aspects of waste disposal emphasising the use of modern techniques involving computers to assess the most suitable method for disposal and use of waste under specific circumstances.

In an International Energy Agency (IEA) research and development programme to co-ordinate research and development activity Krol and Dent of Harwell studied the technologies used in three countries: the United Kingdom, Sweden and Canada. The study indicated how different technologies were of major importance in the different countries according to the availability of disposal sites and of indigenous fuels. Sweden, with its lack of indigenous fuels, regarded waste as an important source of heat, some 60% being used in mass incineration; the heat being used in the popular combined heat and power (CHP) schemes in that country. Being very conscious of pollution problems, suitable methods of combustion and of flue gas treatment were being introduced in both Sweden and Canada to minimise dioxin emissions.

In Britain a high proportion of waste is disposed of by landfill but the number of suitable landfill sites are becoming scarcer. At the present time no attempt is made to use the methane generated at many of these sites but it was clear from a number of papers that the situation was slowly changing and harnessing of the methane was being achieved efficiently and economically on a few sites. One paper in particular, by Biddle, Naylor and Street, gave details of the development at the nearby site at Packington of a carefully controlled system for collecting methane and utilising it in an aviation gas turbine. A visit was made to this site. It was clear that the utmost care was taken to minimise both gaseous and noise pollution. 3.2 MW was being sent to a CEGB sub-station at the time of the visit.

Papers on the incineration of waste included one from Kermode and Wells of East Sussex County Council on their experience with the manufacture and combustion of refuse derived fuel in Eastbourne and a paper by Schlegel describing large waste to energy plants for thermal power stations fired with municipal or industrial waste developed in Switzerland. Their plant included a novel grate design to overcome combustion problems and a boiler design to avoid deposition problems on the heat exchange surfaces.

Municipal waste is an important source of energy which has been badly neglected hitherto in this country and is now being utilised by a few progressive pioneers.

BYROM LEES
Fellow

Competition in electricity *continued*

brought consumer benefits. If the White Paper proposals are implemented in their present form, any social gains will probably be minimal even though there will be virtually as much structural change as if a more thorough-going competitive scheme were adopted. It is doubtful whether it would be worth undergoing all the costs of change for the sake of achieving so little advance on nationalised ownership.

Acknowledgements

This paper is the result of many hours of discussion with Allen Sykes and Tony Merrett about electricity privatisation, although the author bears the responsibility for its conclusions.

References

1 For example, HENNEY A. *Private Power,* Centre for Policy Studies, 1987 and SYKES A and ROBINSON C. *Current Choices,* Centre for Policy Studies, 1987.
2 For instance, the IEA conference in November 1987, the proceedings of which are to be published as *Privatisation and Competition,* Institute of Economic Affairs, 1988.
3 For comments on the British Gas privatisation scheme see *Regulation of the Gas Industry,* Memoranda of Evidence to the House of Commons Select Committee on Energy, Session 1985–86.
4 SYKES A and ROBINSON C. op cit and SYKES A and ROBINSON C. *Privatising Electricity Supply,* Memorandum of Evidence to the House of Commons Select Committee on Energy, January 1988.
5 ROBINSON C. *The Energy Crisis and British Coal,* Institute of Economic Affairs, Hobart Paper 59, 1974.
6 MARSHALL E and ROBINSON C. *The Economics of Energy Self-Sufficiency,* Heinemann, 1984.
7 SYKES A and ROBINSON C. op cit.
8 Ibid. A recent valuation of the CEGB is in HOPE C W. *What is the CEGB Worth?,* Cambridge University Engineering Department Research Paper 4/87.
9 ROBINSON C and MARSHALL E. *Can Coal be Saved?,* Institute of Economic Affairs, Hobart Paper no 105, 1985, and ROBINSON C and SYKES A. *Privatise Coal,* Centre for Policy Studies, 1987.
10 SYKES A and ROBINSON C. *Privatising Electricity Supply,* op cit.

□

Energy from waste

The Energy Technology Support Unit (ETSU) of the Department of Energy gathered together 64 practitioners and interested parties for a workshop on refuse derived fuel (RDF) at Newcastle upon Tyne on the 25–26 February 1988.

The objective was to assess just where all the time, money and effort devoted to the development of RDF over the past decade had got us.

The method adopted to achieve that objective was to have a large number of short reports from those most closely involved interspersed with generous periods of discussion, a formula that worked very well. Valuable contributions came from ETSU and Warren Spring Laboratory but, although operational experience was retailed from Byker and East Sussex Enterprises (who run the Eastbourne plant and are advisers to the Isle of Wight) there was a deafening silence from the two big new RDF plants on Merseyside and at Castle Bromwich, neither of which has yet achieved a commercial operation.

With a good deal of the first day's time devoted to the boiler trials conducted for ETSU by Warren Spring Laboratory each one of which seemed to raise a different problem, an air of gloom was gathering over proceedings. It was lightened in the evening by a reception held by the Mayor of Newcastle upon Tyne and a convivial dinner but tended to return on the second day until Alan Tweedale of Energy Supplies made a characteristically positive and upbeat contribution. It was clever of the organisers to keep him until the end as he was able to assure the delegates that he was burning pellets made in the Byker plant day in day out in a chain grate boiler, specially designed for the purpose by NEI, with no serious problems. Thus uplifted we went down to the Byker plant to see this wonder for ourselves.

When it comes down to it the essentials are a grate that is fast enough and of the correct balance of underfire and overfire air thus leading to efficient combustion and heat transfer in the fire tube. Deposits will then be limited to amounts that can be dealt with by steam blowing. Since these facts were known several years ago when the fuel's combustion characteristics were established, it is surprising that it has taken so long to produce an appropriate boiler.

It is unfortunate that problems with aluminium accretions when burning RDF pellets in one particular type of shell boiler fitted with a shallow fluidised bed has put ETSU off fluidised beds in general. The evidence from Sweden and Japan showed that they were very suitable for burning municipal solid waste even with a minimum amount of preparation. Your energy from waste correspondent has recently been to Sweden and will report on what he saw there in the near future.

One aspect of RDF which received scant attention at the seminar was to some minds the most important aspect: namely the economics of the operations. There is no point in great technological achievements in producing and burning RDF pellets if it is an expensive way of getting rid of approximately one third of the refuse stream. At current energy prices the indications are that the economic viability is borderline at best, if a market can be worked up — as should clearly be possible — for the excellent compost that can be made, quite easily, from the fine screenings the combined processes could be very profitable. The influence of geography on the market is interesting, in the south there are not so many industrial users of solid fuel but others such as market gardeners are interested in RDF because they pay a good deal more for their coal.

On the whole the workshop was a useful appraisal of the progress made to date on one of the several ways of recovering energy from waste. It would appear that there is not any more significant development work to be done, any future plants would only be variations of existing themes, and ETSU are not funding any more demonstration schemes. They are turning their attention to the use of landfill gas but at present gas prices that is only economic at very large sites with outputs in the region of 10 M m^3 in a year. Perhaps they should also consider the economics of different methods of direct burning for the generation of electricity.

R G LORAM
Associate

Due to our rapid technological development it has taken a dramatically short time for our species to make very serious inroads into the usable energy stocks on planet earth; and to make serious attacks on the long-established natural mechanisms for capturing incoming energy.

We can perhaps excuse much of the historic waste of fossil fuels and widespread destruction of photosynthetic organisms, on the basis of gross ignorance. Today we have no such excuse as, collectively, we have quite a good understanding of energy resources and the mechanisms and potential for energy capture; but, the understanding is vested in too few people. Those who graduate over the next few decades are going to have to do battle with apathy, ignorance and political reluctance in order to secure the survival of all we regard as 'quality of life'.

Fortunately, over that geologically brief time span, the sun will go on shining in almost identical splendour, and if we are (or can become) sufficiently wise, and more universally well-informed, we may be successfully harvesting a much greater amount of direct solar energy than we do today. To achieve this we shall not rely on simple historic processes like producing hay, or a few tonnes of sun-dried fruits; we shall be using physics, chemistry, biology and all branches of engineering to harness more of that vast energy flux that continuously bathes the earth. What an exciting challenge!

We are indebted to Dr Norton of the Applied Energy Group, Cranfield Institute of Technology, for the following insight into the career opportunities in solar energy that exist now, and that will undoubtedly increase as we continue to deplete our fossil fuel stocks.

James P MacCarthy, chairman, Membership Committee

A career in the sun?

Dr Brian Norton*

For those concerned about a sustainable future for mankind, a career in the field of renewable energy is often appealing. If this is you, this short article is an encouragement to persevere. The focus is on only one renewable, solar heat, but the comments can be read more generally.

That one can lecture and do research on solar energy and its applications in the UK often takes people by surprise. 'But there isn't enough sun,' they say, and 'Of course, solar energy is not economic in the UK'. Though such comments have a certain veracity, particularly in their understanding that economics determine the extent of solar energy use, they also indicate the lack of knowledge of what modern solar energy applications are and what solar energy researchers do for a living. For example, the 'passive' solar heating of a building, means, in its simplest form, orientating the building to the south, placing the fenestration and arranging the living areas on the south aspect and placing buffer spaces, that is stairwells and garages, on the north side. The building itself is the 'solar collector'. Though there may be a greater cost incurred during the design phase (perhaps in calculating how to avoid overheating in the summer) the cost of such a simple 'direct gain' building is no more than a comparably-sized one of 'conventional' construction.

This application of solar energy can thus be economic in the UK now. Such an approach to the design of buildings challenges conventional assumptions concerning the roles of different professions in the building design process. To achieve success in this area, architects and engineers work together increasingly in multi-disciplinary practices. Many graduate 'energy engineers' from Cranfield have found successful and rewarding careers in such companies.

Internationally, of course, a wider range of solar energy applications have found widespread use. Sunnier climes and high fossil fuel prices render systems ranging from water heaters, the drying of tropical crop driers, refrigerators to some forms of industrial process heating, viable economically. A number of UK consulting engineers have found a particular market niche in supplying consultancy services for the development of such applications in projects overseas. A solar energy system generally has a comparatively high initial cost but low, or non-existent, recurrent expenditures for fuel. This is in complete contrast to conventionally-powered systems. The key skill is thus to design solar energy systems that have a long operating life, in other words systems that are efficient, reliable and robust.

The demand for solar energy skills, and indeed in other renewables such as wind or biogas, is modest in comparison with, say, the petrochemical, gas turbine or nuclear industries. However, the number of qualified specialist personnel is similarly small and tends to just meet the demand. Thus, the career prospects of those who have studied renewable energies and who are also engineering realists would generally be very good. All graduates I have known who have sought a career in the solar energy field have gained one. □

*Solar Energy Technology Centre, School of Mechanical Engineering, Cranfield Institute of Technology

Look at the track records

I was very disturbed to see a major contribution to the literature, *Nuclear power: policy and prospects* (edited by P M S Jones) so slightingly dismissed under 'Books' in the May issue of *Energy World*.

This is not to argue that the authors have got it right but to contend that if they have not then we need something more than claims that their view does not coincide with that of the *Financial Times* to sustain the argument. Though complaining of the 'mindset' of nuclear thinkers the reviewer claims, of the United Kingdom nuclear industry, that it has a 'track record that others might call execrable'. The reviewer does not specify the nature of this track record but what the public most clearly concern themselves with is the safety record. Now, whatever has happened abroad (two serious incidents, one without injuries) there has been no serious incident in the UK. (Windscale 1957 had no connection with nuclear power.)

Any historical review of the development of hazardous technologies shows that generally they have had, in their early stages, a number of serious incidents from which lessons have been learned, albeit sometimes rather late in the day. The mining of coal is a case in point. Even during the last 80 years in the UK there have been single incidents which have claimed more than 400 lives. The public were shocked but there was no demand to phase out coal mining. Regarding more recent technologies, in my book *Major chemical hazards* (reviewed in the January issue of *Energy World*) I gave a number of case histories of serious disasters involving fires and explosions. A significant proportion of these involved liquid and gaseous fuels. I would add to these the Vaiont, Italy hydroelectric disaster of 1965 which killed 38 times as many people as Chernobyl.

Track records have to be compared with track records. The track record of nuclear power in relation to disasters is excellent when compared with coal, oil, gas and hydroelectricity.

V C MARSHALL
Fellow

See 'Nuclear power in the real world' p14

Can the weathermen be trusted?

Having just read Byrom Lees' article in the May issue of *Energy World*, I understand his concern about the excavation and transport of very large tonnages of limestone or chalk and the disposal of the gypsum effluent. However, I have some doubt whether meteorological forecasting would be accepted as sufficiently accurate to justify only the occasional operation of the magnesium hydroxide dry injection alternative. Therefore, I would be interested to hear from the author what would be the relative tonnage and cost of magnesium hydroxide required (versus calcium carbonate) if the magnesium hydroxide dry injection were operated 100% of the power station operating time. What prices per tonne of magnesium hydroxide and of limestone did the author assume in his cost comparison figures?

DR D WATSON
Member

Research says they can be...

Considerable work has been done by members of the UK Meteorological Office on the accuracy of plume trajectories using operational forecasting models[1], particularly relating to forecasting the path of plumes from Britain to Scandinavia. One reason why meteorological forecasting would be feasible is that it would not be required to forecast several hours in advance before the additive could be introduced. With suitable controls, the additive could be introduced at all or selected power stations, in the required concentration for each boiler immediately the decision was made that the meteorological conditions were such that it was required.

The reasons why I did not select limestone were as follows:

(*a*) It is desirable to inject the minimum quantity of effective additive. The molecular weight of magnesium hydroxide (58) is much lower than that of limestone, impure calcium carbonate (100), and the quantity required would be correspondingly less.

(*b*) It is desirable to have the additive powder as fine as practicable, preferably below 5 μm mean diameter. Magnesium hydroxide precipitated from sea water meets this requirement and costs about £240/t.

(*c*) Magnesium hydroxide is very reactive, convenient to handle and non-hygroscopic.

(*d*) Reaction with acids on the ground or in the lakes in Scandinavia would produce water soluble magnesium sulphates and nitrates.

Considering 19 coal fired power stations in the CEGB with a capacity of 500 MW or more, the quantity of additive required for 100% of the operating time would be 0.25 M tonnes pa costing £60 M but with control according to meteorological conditions the quantity would be less than half this tonnage.

BYROM LEES
Senior Fellow

[1] MARYON R H and HEASMAN C C. *Atmospheric Environment* 259, **22**, 1988.

(LETTERS continue overleaf)

Is engineering becoming women's work?

Margaret Mead makes the point that, *'Men may cook or weave or dress dolls or hunt humming birds, but if such activities are appropriate activities of men then the whole society, men and women alike, votes them as important. When the same occupations are performed by women they are considered less important.'*

In Penny Soper's valuable article 'Towards a more balanced profession' (*Energy World*, May 1988) she states in her opening abstract that she had heard 'plenty of talk about the scarcity of budding engineers and employers' efforts to encourage more girls to apply for engineering jobs'. This statement alone says much about the engineering professions and highlights how little the position of women has changed.

As production, service and manufacturing have moved outside the home so have women but they have always been maintained subordinate to men. When typewriters were first introduced they were regarded as highly technical pieces of equipment and typing was a man's job, a skilled job and well paid. Now typing is a woman's job, badly paid and typing as a skill is not considered anything particularly special.

The status of the engineering profession in the UK has fallen dramatically. Between 1981 and 1987 the number of full-time undergraduate engineers fell by 11%.[1] More girls are pursuing engineering but even more boys are seeking alternatives, for example in finance which is increasingly the object of young mens' ambition. One can clearly interpret the paternal hand onto the career ladder as a profession in crisis, little related to any true appreciation of women's abilities or career profile and hence is sure to maintain us in vacuum, filling up the lower rungs. Engineering in the UK is now seen as a poor cousin of other professions, poorly resourced, unimaginative, invisible, poorly paid, with poor prospects and low status, *women's pickings*.

It is time that those in the upper echelons of the profession took charge to drag UK engineering into the 1990s; to raise the status and prospects to that in other countries and to provide all school children with the equal educational opportunities that best encourage their ingenuity. Only then will we stop wasting talent and not only will women engineers be able to escape second class status and have genuinely fulfilling careers but the UK may find itself better able to compete in international markets.

SANDY HALLIDAY
Building Engineering Dept, University of Bath

1 Universities Statistical Record, **1**, Students and Staff.

Of 'caveats' and 'veritas'

I am sure that Dr Brookes (*Energy World*, June 1988) is far too warmhearted to be in any danger from letting my comments curdle his blood as his spirited and erudite ending confirms. I was also indirectly making the point that if we are asked to buy a secondhand nuclear power station we should know something about its history and performance. Most people would probably prefer to buy Hunterston A, with a cumulative load factor of 81.8% and ranking first in the world's annual performance table for the 12 months to the end of June 1987, rather than Dungeness A (cumulative load factor: 57.8%, poor by world standards).

I am afraid that I cannot enlighten Dr Brookes about the figure of £40 000 quoted by the technology correspondent of the *Daily Telegraph*. However, assuming this figure represents the loss because the reactor was running at 350 MW instead of its 'normal' output of 410 MW, my figure of £54 000 was simply based on the actual life time performance average of 329 MW, a reduction of 81 MW from the 'normal' output. $81/60 \times 40\,000 = £54\,000$. *Quod erat demonstrandum*.

By selecting different values for the hypothetical cost of the replacement coal it would of course be possible to show a variety of figures for the cost of 'lost' nuclear power.

I hope we can both agree that we should not always believe everything that we read in the newspapers (or in the correspondence columns).

Caveat lector et quaerere verum.

DR CLELAND McVEIGH
Fellow

Nuclear power in the real world

V C Marshall (above) invites me to specify the nature of the track record of the UK nuclear industry. In more than three decades it has never once completed a nuclear power station on schedule or within budget, nor one that performs up to its original design specifications. Lord Marshall of the Central Electricity Generating Board conceded in 1987 that UK nuclear electricity still cannot compete economically with other forms of electricity.

As the present government prepares to sell off the electricity supply industry, it has been forced to acknowledge that the 'free market' to which it is so rhetorically devoted would reject UK nuclear power out of hand. I made no reference to the 'views' of the *Financial Times* — only to its reporting of the real world. Nor did I refer to safety. If a technology costs more than alternatives, and fails to do its intended job properly, claims about its safety ring curiously hollow. The safest nuclear power station is one that is not working; by that criterion, UK nuclear stations have been far too safe for far too long.

WALTER C PATTERSON

History and practice of the law of mines and minerals

Jean Cantlie Stewart
Rowan Books, Banffshire, 1987
128pp. £7.80

This unpretentious little book, fitting comfortably into one's pocket, fills a long felt need for a text which serves as a guide through the labyrinth of the law as it relates to mines and minerals. Unfortunately, neither mine nor mineral is adequately defined although the author does explicitly comment on the fact that the meaning depends very largely on the context. Indeed this bears out the reviewer's own experience which suggests that a mineral (and by inference a mine) is a mineral if so described in the vernacular of the locality. Not perhaps a masterpiece of definition but one that has stood the test of time and is in full accord with Humpty Dumpty's thesis.

Law for the non-lawyer is not easily digestible but Jean Cantlie Stewart's book is more palatable than most legal expositions. Copious references to legal cases will prove of considerable value. There are of course omissions but this is inevitable when dealing with such a wide subject within the confines of a small book. No mention is made of the transfer of mineral ownership by 'horigons', that is the practice of selling say base metal rights down to 500 ft depth to one person and between 500 ft and 1000 ft to a different purchaser. This can give rise to tremendous problems as can the practice of differentiating between metals contained within the same ore or rock. As a result it can often take several years before the unfortunate mining company seeking to work a deposit can obtain the approval, or sometimes even the identity, of all interested parties.

It is perhaps also worth clarifying the position of crown mineral interests particularly in the light of the significant resurgence of interest in gold mining within the UK. It is not quite correct to say that all gold and silver mineral rights are vested in the Crown. There are limited exceptions. For example, Crown rights to these metals do not exist in Sutherland and the situation is somewhat clouded in certain of the islands off the coast of Britain. As regards the sea bed, not all tidal land belongs to the Crown. About half the UK foreshore, the land between high and low tides, has been granted away or sold. However, with negligible exceptions the sea-bed around the UK is owned by the Crown Estate up to the 15 miles territorial limit as a freehold possession. Beyond the 12 miles limit the Crown possesses the sole rights to exploit the natural resources of the UK continental shelf. These are significant; no less than 16% of Britain's need for aggregates is met by marine dredged sand and gravel.

Considering the ramification of the authors' subject, she is to be congratulated on almost achieving the impossible by accommodating a quart in a pint pot. A most useful publication.

A Grierson

Landfill gas — a global review

K M Richards
ETSU/Department of Energy, 1987

This report was first presented to a rather esoteric sounding gathering called 'The Seventh International Biodeterioration Symposium' at Emmanuel College, Cambridge on 8 September 1987.

This very thorough review of the worldwide landfill gas scene was written by ETSU's project officer in charge of research into energy from biomass in general. Landfill gas is currently the major research activity. Dr Richards has put together a clear picture of every aspect of landfill gas from how it is produced to its use, and something of its economics. It provides both useful background reading for those already involved and a readable, comprehensive introduction to those who are not.

Although written by a scientist whose job it is to help promote the use of landfill gas, the review is very even handed in considering the economic merits of recovering the energy in municipal solid waste (MSW). He notes that in urban areas where bulk transfer of landfill may be needed, direct incineration with energy recovery or refuse derived fuel (RDF) production may be more economical as well as more efficient. The report mentions 56 schemes generating electricity, between them producing only 170 MW of capacity whereas a single large direct burning generating plant handling the equivalent of a large landfill site, say about 1000 tpd, would expect to generate at some 22 MW on a 24 hour basis.

In reviewing the methods of utilising landfill gas Dr Richards reports that piping the gas to an adjacent boiler or kiln is the most economic. Electricity generation is the next most popular method and purifying the gas to bring it up to pipeline standard, although practised, is uneconomic. He gives the American standard to which the gas would need to be purified but this would have been of more value had he given the same figures in SI units.

Dr Richards highlights the fact that many schemes started up in a more favourable climate of high energy prices; the subsequent fall has made the economics much less favourable, especially for the smaller sites. He reckoned that sites producing more than one milion therms a year could still be viable but at today's prices, with natural gas at about 17p a therm (Brent crude $14.0 a barrel), even that size of output would be of doubtful viability and you certainly could not afford to pipe it any distance to a user. It would have been nice to have had at least some guidance figures on the economics of generating electricity from landfill gas as it is currently looking rather dubious. It is likely that many of the small sites generating electricity; making virtue of necessity where the gas needed to be gathered and flared off for safety reasons. The generation of electricity was, at least partially, able to offset that cost. This was certainly the case with the Otterspool scheme.

One, fairly minor, cricitism is that in Table 2, 'Details of Landfill Gas Schemes by Nation', the details of the UK schemes give the outputs in terms of tce pa saved which cannot be readily compared with the output figures given for the US and West German schemes.

R G Loram

Municipal solid waste conversion to energy — summary of current R & D in Sweden

Andre Krol and Chris Dent
HMSO
£10.00

This report is one of four produced by the authors, who are from the Environmental and Medical Sciences Division of Harwell Laboratory, in the course of a three nation study of energy from waste (EFW) under the International Energy Agency's Biomass Energy Agreement. The countries participating in the study are Canada, Sweden and

the UK. The other three reports deal with the other two countries and a summary of the whole study.

The report is very extensive, covering all aspects of the EFW scene in Sweden and is particularly informative on the economic and environmental viewpoints. That is not to say that there are not still some questions to be asked but the authors have provided a lot of solid information of great interest. For instance a UK reader would be surprised to read that at one large incinerator generating heat for district heating the waste is actually bought and at another it is bought for the winter but its disposal is charged for the summer. This would seem to be partly because of the high value of district heat in the winter. More detail, especially of the treatment of capital costs, is needed; nevertheless it is very encouraging for the advocate of EFW.

Three types of energy recovery technology are examined, mass-burning incinerators, fluidised bed boilers and waste derived fuel (WDF) production; there is considerably more economic information about the first.

As might be expected considering the division at Harwell in which the authors work, the coverage of the environmental aspects is very thorough and, at times, highly technical so there are places where the non-specialist may get a bit lost. The Swedes license each EFW plant individually in the light of its particular situation but there are severe emission limits which apply nationally. These limits are similar to those that are likely to be imposed later this year, under EEC regulations, on any new EFW plants built in future in the UK. These regulations will require more effective gas cleaning than can be achieved by electrostatic precipitators or bag filters on their own and one of the most interesting sections of the report deals with the sophisticated gas cleaning methods developed in Sweden. Probably the most exciting of these is the flue gas condensing technology developed by both Gotaverken and Fagersta Energetics. These systems, which are very effective in cleaning the flue gases, enable the waste heat in the gas to be recovered; where the low grade heat can be used, for instance for district heating, the installation pays for itself over a fairly short period. The UK engineer will want to know how else he could use that heat, district heating being unlikely, because the savings on what would otherwise be a very expensive piece of plant to install and run (which applies also to systems without heat recovery) are of crucial value. Cost free gas cleaning can do wonders for the economics of EFW.

The section on the use of fluidised bed boilers is at once interesting and tantalising; there are intriguing figures in the tables and diagrams but a dearth of comment upon them in the text. Fluidised bed boilers have two attributes which indicate that they should be well suited to burning municipal solid waste (MSW). Firstly they are specifically designed to burn low grade fuels and, secondly, by adding limestone to the bed acid emissions can be drastically reduced. It is notable that the bubbling fluidised bed boiler at Eksjö, commissioned in 1979 is still going strong and apparently operating at a profit despite a fairly low throughput and a modest price for its heat. The Swedes seem to be convinced that fluid bed boilers are good for small installations, at least as they have now built seven; four bubbling beds and three circulating beds, two of the latter having been commissioned in 1986. Information given in tabular form shows that most of the plants are operating at below design capacity but no reasons are given and there is precious little information about their economic performance.

The production of WDF and composting were both heavily supported by government grants in the mid 1970s but are not now considered to be the optimum recovery route. However, research into WDF production is still being carried out.

The report is largely based on publications and papers from several Swedish governmental bodies.

This report must be considered to be compulsory reading for anyone seriously interested in the total energy from waste field.

R G Loram

Advanced coal-use technology

Walter C Patterson
Financial Times Business Information, 1987
123pp. £180.00

Coal-use technology is not a topic that I normally associate with easy and enjoyable reading. However, *Advanced coal-use technology* by Walter Patterson stands out as having both of these qualities. Rarer still, it combines them with a thorough, serious and perceptive analysis of the background to and prospects for the main developments in new coal utilisation technologies.

The aim of the report is to review the main strands of the rapidly changing technologies of coal use, with particular emphasis on those developments which are likely to impact on the pattern of coal consumption in the next 10–20 years.

The story begins with a back-to-basics review of the questions — Why consider coal? What are the traditional combustion methods? How do the environmental effects of coal combustion occur? The technologies available for abating environmental emissions from conventional combustion equipment are also considered at this stage.

Next to be discussed is fluidised bed combustion. The fundamental principles of the technology are considered first, followed by separate chapters on bubbling bed, circulating and pressurised FBC. In each case, technical progress is traced through the varying, and sometimes cyclic, degrees of interest shown in the research and development. This then provides the background for a review of the current state-of-the-art and an assessment of the technical and, for the more developed technologies, commercial options now available.

Finally, the report addresses, somewhat more briefly, the technologies for indirect coal use by conversion to gaseous and liquid fuels. The approach is the same; first, the technical background and historical development are explained to set the scene, and then the current situation and the prospects for the future are discussed.

The report sets out to provide a concise critical guide to advanced coal-use technology, aimed particularly at coal users and potential coal users. In my view, it succeeds admirably in these objectives. The style is lucid and direct, and the analysis well-argued. I wish the report every success.

David Merrick

Acid rain — a perspective

Edited by John Ward and David Browning
Open University in Wales and the Institute of Energy, 1988
102pp. £25.00 (from the Institute of Energy)

The aim of this set of papers is to present the essence of the problems of acid rain in a balanced way, firstly studying the cause of the problem, then analysing the types of damage that might be caused by acid rain, particularly related to Wales. Finally in a paper from the CEGB solutions which might be adopted in the near future and in the long term are considered.

The subject is so politically controversial and it is difficult to come to definite conclusions as to cause and effect that the papers are essentially a continuation of previous published work. Nevertheless there are steps forward and the introduction of some

new thinking makes the papers interesting and valuable reading.

Modifications to forestry planning to reduce the acidifying effect of the introduction of forests on streams is considered in a paper by W O Binns. He emphasises the need for further carefully conducted surveys to assess whether the effect of acid rain on trees in the British Isles is serious or not.

D H Buckley-Golder of ETSU places emphasis on the seasonality and the concentration of 30% or more of total acid deposition in less than 5% of the rainy days in the year. This is a factor which so far has apparently not been taken into account when desulphurisation of flue gases is considered.

Papers by A K Barbour of Rio Tinto Zinc Corporation and W D Halstead of the CEGB outline the main sources of sulphur dioxide and NO_x; the different methods at present being considered for use in power stations in Britain for reducing acid emissions and future methods which may come to fruition.

Other papers study the effects of acid deposition on the characteristics of lakes and their relationship to fish stock and of methods of improving streams and lakes, particularly in Wales.

An interesting and clear series of papers bringing up to date information on this vexed question.

Byrom Lees

Biomass energy: from harvesting to storage

Edited by: G L Ferrero, G Grassi and H E Williams
Elsevier Applied Science, 1987
327pp. £34.00

This book records the proceedings of a workshop held in Italy in November 1986; it comprises a set of papers followed by an edited summary of the sessions and the subsequent discussion.

The potential importance of biomass from agricultural waste is set out in the first paper which outlines the European Community's research programme. At the time of the workshop there were 80 active projects being supported by the Community who provided 27% of the funding.

The total 'waste' energy produced in the Community is equivalent to 100 Mt of oil a year; this includes urban and industrial waste as well as that from agriculture. The annual economic potential is given as 50 Mtoe (greater than the annual coal production in Britain) of which 15 Mt could be being exploited by the end of the century. This is large compared to other alternative energy resources such as geothermal (say 5 Mtoe/y), solar (10–20 Mtoe/y) and wind (5–10 Mtoe/y); of the biological energy, 80% is available from agricultural wastes, equally divided between animal and crops and the rest from forest and wood waste.

We are very familiar with the theme that enormous quantities of energy are available if only a little more research was done to make their methods of production more viable. There are many problems in exploiting the biomass energy resources and the papers in this workshop provide detailed information on many of the techniques available and the R & D projects being pursued.

The papers concentrate on forestry, energy crops and crop by-products such as straw and tree prunings with economic evaluations. The papers deal exclusively with harvesting and storage and there is nothing on developments in methods of combustion and using the energy generated.

Within this limited compass there is much of considerable interest particularly as most of the papers are from continental Europe. The first section of forestry analyses work on various techniques of felling and removing timber. The terrain is important and, as forests are often in mountainous areas, the capacity and performance of the mechanical equipment will often be well below its rated values. Some of the papers describe and compare the performance of commercial equipment which is mainly of value to experts.

A French paper evaluates integrated systems (with 'Scorpions' which fell, haul and chip the timber, transferring the chipped wood to a truck for transport) with two machined systems used in selective forest thinning. The felling machine can fell 300 poles per hour. One of the problems with fast growing plantations is that the machines have to pass through the forest and if the operators are not careful they can damage the soil and reduce the yield of future tree planting. Typically fast growing coppice growth would be harvested 7–12 years after planting.

Of course, the timber has other uses, for example, poles and fencing and there is a need for selection of timber for chipping. Drying of the chipped wood considerably improves its value as a fuel but, outside southern Europe piled chips get wetter rather than drier and can deteriorate. The centre of a pile gets hot and the pile must be turned.

There is also a need to consider the best season for felling, to keep the moisture levels as low as possible. This, of course, must be balanced against machine productivity, considered as a yearly average in the Irish paper which gives the cost of oven-dried short rotation forestry chips at 158 ECU/toe against current world prices of 200 ECU for heavy fuel oil and 125 ECU for coal. This paper by G J Lyons of the Irish Agricultural Institute is a key one in that it sets the scene for forest energy commercial exploitation as a way of using land released from agricultural use by the new EEC agricultural policies.

Prof Abeels of Lourain University in Belgium reviews the range of biomass materials, their calorific values at the various available harvesting technologies. This is a valuable paper with some economic comparisons although some of the units used are unfamiliar to me (what is a stere?). The author suggests using biomass in a pulverised form.

There are a number of special papers dealing with sorghum, aquatic crops, rice straws, straw and wood chips, maize, vine, olive and orange tree residues. There is a review paper on gas production from municipal waste with an impressive list of references.

This book presents a wide range of material on harvesting and storage of biomass which has received only limited attention in energy engineering up to now. The format is less convenient than a fully edited textbook and there is inevitably much overlapping and some areas receive only limited attention. However, there are a number of useful reference papers and extensive data. A table listing the limits used by the authors and their conversions would have been useful.

N G Worley

Recently published

Code of practice for the introduction of unleaded gasoline
Institute of Petroleum, 1988

Recommended salary levels for professional engineers 1988
and
A guide to the classification of professional engineering responsibility levels.
UKAPE (United Kingdom Association of Professional Engineers), 1988. Both publications are available from: UKAPE, Hayes Court, West Common Road, Bromley, Kent BR2 7AU. Tel: 01-462 7755.

EEO
The future

Mr Peter Morrison made the following announcement to Parliament on 9 June 1988: 'As I indicated in my written Answer of 22 January, consumers are now well aware of the case for energy efficiency. The Energy Efficiency Office (EEO) is therefore entering a fresh phase. I have decided that its aims will now be to run specific and targeted services backed by technical support, including guidance on the use of the energy efficiency industries; and to ensure that builders and property managers have the necessary technical advice.

'Accordingly, from 1989/90, the main areas of the EEO's work will be:

(*a*) a better regional service offering specific advice and RD&D support to industrial and commerical firms;

(*b*) continuing support for Community Insulation Projects targeted on pensioners and low income households;

(*c*) new ways of improving the energy efficiency of housing.

'As part of the conclusion of the first phase of the EEOs work, I have decided to bring an end to the Energy Efficiency Survey Scheme. There is no wide public appreciation of the potential value of energy surveys, and grants for this purpose are no longer justified.'

Dr Elliot Finer, Director General of the EEO, will be contributing to the Personal Viewpoint column later this year.

Source: Energy Efficiency Office

Review of world energy
Consumption is still rising

World energy consumption continued its steady climb in 1987, recording a higher growth rate than in either of the two preceding years. The *BP statistical review of world energy* shows that in the oil sector, however, the 1987 rate of growth fell to less than half that of the previous year.

In 1987, world energy demand rose by 2.8% to 7.8 billion toe. In the OECD countries, energy consumption was up by only 1.9% but was offset by stronger demand in the centrally-planned economies (CPEs) and the lesser-developed countries (LDCs).

Demand for oil throughout the world rose by 1.4% in 1987 to more than 61 Mbpd, well below the 3% increase in 1986. The decline in the rate of growth is largely the result of the recovery in oil prices, which improved the competitive position of other fuels.

World oil production was virtually flat in 1987 at just over 60 Mbpd, compared with an increase of 4.8% bpd the previous year. OPEC production declined 2.7% to 19 Mbpd (including natural gas liquids), while US production dropped 3.6% for the year. This was offset by increased production in the USSR.

The Soviet Union led the world as the top oil producer for 1987 at 12.7 Mbpd, followed in order by the United States, Saudi Arabia, Mexico and China.

The United States led the world as the top oil consuming country, averaging nearly 16 Mbpd. Rounding out the top five were the Soviet Union, Japan, West Germany and China.

Primarily as a result of the major revisions announced by Venezuela, Abu Dhabi, Iraq and Iran, published proved oil reserves increased a massive 27%. The revisions have added nearly 10 years to the life of the world's reserves at current rates of production. Not allowing for new discoveries, proven reserves of 896.5 billion barrels are now sufficient for about 40 years.

Natural gas production grew by 5.3% in 1987 to more than 1.6 billion toe. This increase reflects higher demand for natural gas as prices became more competitive following an eventual adjustment to 1986's oil price fall. The USSR continues as the world's largest gas producer and set a new record with a production increase of 5.8% to 653 Mtoe.

In Western Europe, natural gas consumption continued to rise, up 6.4% to more than 206 Mtoe from a year earlier. US consumption increased 2.6% for the year.

Coal consumption worldwide increased 2.9%, while production increased 3.4%. China led the world in consumption at more than 553 Mtoe. The USSR again reached record levels in 1987. In the USA, coal output was also at an all-time high.

The world demand for nuclear energy continues to rise. It was up 7.3% in 1987 to 404 Mtoe, but its future remains clouded by political uncertainties.

Source: BP

Investment in energy efficiency
Must continue

Mrs Helga Steeg, executive director of the International Energy Agency spoke recently about the importance of energy conservation at an energy workshop organised by the Danish Ministry of Energy. She was concerned that given the current excess of supply over demand, there was little need for further efforts in energy efficiency. She said, 'Energy conservation plays a pivotal role in supply security by slowing energy demand growth during periods of economic growth. It extends the availability of low-cost fossil reserves, moderating price growth. It also enhances the efficiency of an economy generally and, by requiring less energy to produce the same services, it reduces the environmental impact of energy production and use. I will develop each of these items in turn.

'With regard to energy security, the most flexible energy resource, oil, has the bulk of its low cost reserves concentrated in a single geographical area, the Middle East, which accounts for only a minor part of world consumption. This of course has security of supply implications if consumers turn only to the cheapest energy source of the day, oil. Economies would not develop the necessary flexibility to cope with supply difficulties, should they arise.'

Mrs Steeg told the workshop that the generally positive benefits to the international economy of lower energy prices resulting from lower demand for, and thus the extended availability of, low-cost fossil reserves, were clear from recent history. Government therefore had a direct interest in ensuring that every economically viable conservation option was exploited.

'In terms of economic efficiency, conservation and efficiency investments are in many ways the poor relation of more conventional energy investments,' she said. 'Yet the evidence would suggest that in many instances these investments provide a better return than similar investments in energy supply. For example, insulating buildings to appropriate thermal standards or providing comfortable, efficient electric rail systems can both provide cheaper alternatives to expanding energy supply and production. Of course investment in supply is needed. You cannot drive your car on conservation, nor supply electricity with it! But

overall investment in supply can be reduced and less energy consumed if we undertake cost-effective investment in conservation. This will increase the efficiency of end-users and our economies as a whole. Therefore demand growth reduction through energy efficiency and diversification of energy supply are the twin goals to be achieved, maintained and improved upon in our long-term strategy to achieve security of supply'.
Source: International Energy Agency

Power station design Small is beautiful

Electricity privatisation has created growing interest in the UK in British Coal's development of new, small custom-built coal-fired power stations — using advanced fluidised bed combustion techniques. They will provide the answer for generating companies seeking plant which could generate electricity cheaper than traditional power stations, are quicker and less costly to build, and burn coal in an environmentally cleaner way', said Dr David Dainton (Fellow), British Coal director of Coal Research.

Dr Dainton, was speaking at the international Clean Coal Conference, sponsored by Friends of the Earth, the International Coal Development Institute and British Coal. Leading experts on pollution prevention, energy strategies and coal combustion from Britain, Europe and the United States discussed the key environmental, technical and policy challenges linked to the future of industrial coal use.

Future new generating companies are likely to favour smaller power stations and Dr Dainton gave the main reasons:

■ Private sector companies would no doubt seek higher returns on capital investment than the five per cent discount rate used by the Central Electricity Generating Board.

■ Small power stations, for which the majority of the equipment could be prefabricated before transport to the site, offer the potential for shorter construction times and hence major savings in interest payments — which would become a more significant element of total costs than at present.

■ Shorter construction periods could enable plant to be ordered nearer the time when the capacity is actually needed on stream.

■ Smaller plants require less land and would, therefore, offer greater flexibility in the choice of sites — allowing them, for example, to be located close to major electricity consumers such as cities or industrial complexes.

Performance estimates indicate that in comparison with a similar size conventional power station fitted with flue gas desulphurisation, a 400 (nominal) MW generating plant based on a pressurised fluidised bed combustion combined cycle (in which gas made from coal drives a gas turbine) the exhaust gases from which are used to power a conventional steam turbine in order to produce additional electricity, would:

■ Have a net efficiency of more than 44%, compared with about 37% for a conventional station.

■ Provide a saving of nearly 10% in the cost of generating electricity, due largely to the considerable savings in fuel costs arising from its greater efficiency.

■ Burn coal in an environmentally clean way by enabling sulphur and nitrogen oxide emissions to be controlled without the need for expensive flue gas desulphurisation equipment.

A proposal for support for construction of a 60 MW demonstration plant, aimed at proving the performance and operability of the 'topping' cycle, has been submitted to the Government's Advisory Council on Research and Development.
Source: British Coal

Privatisation More questions

The Confederation of British Industry (CBI) has said that the Government's claim that competition in the privatised electricity supply industry will lead to reduced electricity prices will depend on the way in which several key, and as yet unanswered, questions are resolved.

This was made clear in a CBI discussion document on the Government's White Paper on electricity privatisation, now being circulated as part of a major consultation exercise to member firms in the steel, chemicals, paper, man-made fibre and other industries which are heavy users of electricity.

This followed a presentation on electricity privatisation by Energy Secretary Cecil Parkinson and a preliminary discussion of the document by the CBI's Council at its May meeting.

The CBI, which backs both privatisation and the development of nuclear power, is seeking answers from its members to these questions:

■ Will the Government's proposals encourage sufficient new entrants into power generation and promote adequate competition?

■ Should the national grid be set up solely as a common carrier?

■ Should attempts be made to insulate the privatisation programme from the uncertainties associated with nuclear power?

■ Where should the regulatory effort be concentrated; how can the burden of regulation be minimised without undue risk to the cost and quality of supply?

■ Are the Government's arguments for electricity price increases for business consumers, announced earlier this year, sound; how should prices be determined in the competitive market of the future?

Mr John Banham, CBI director general, said, 'Electricity prices for heavy industrial users were higher than in France, Italy and Belgium before the latest round of price increases, amounting to 8–12% this year alone. These will add over £1 billion to industry's costs by the end of next year.

'Many members are not yet satisfied that there will be sufficient new entrants into generation to reduce costs overall. Others fear that the inclusion of nuclear power within the larger generating company proposed by the Government could lead to higher costs for the industry as a whole and a damaging "fudge" to mask the true costs of nuclear generation.'

Mr Banham added: 'The CBI considers that the option of nuclear generation of electricity must be kept open for strategic reasons. But the size of the "insurance premium" that the nuclear option represents must be clear.

'Access to the national grid and the local networks of the new distribution companies will have to be on terms which allow large industrial companies to strike deals with power stations direct, and new generating companies to enter the market freely. The undue preference clause in the current law, which prevents one class of consumer subsidising another through price differentials, will need to be changed because intensive energy using companies have found that, in practice, it puts a brake on their negotiating prices which reflect the cost of bulk supply.'
Source: CBI

Electricity generation... ... and coal mining

Owners of Britain's privatised power stations may invest in coal production as part of their efforts to cut costs and broaden their fuel supply, forecasted Lord Marshall, chairman of the Central Electricity Generating Board, the *Financial Times* reports. He made his prediction at a session of the Commons Energy Committee.

Asked whether generating industry

might diversify into coal after privatisation, Lord Marshall cited the example of Japan where private electricity utilities obtained coal from their own mines, as well as from outside mines under long or short-term contracts.

On coal imports the CEGB's evidence to the committee gave little comfort to British Coal. Sir Robert Haslam, British Coal chairman, has warned of further pit closures if electricity privatisation leads to an importing free-for-all.

British Coal has been calling for long-term bulk supply contracts in advance of the electricity industry's flotation. Failure to secure such contracts, it fears, will create uncertainty in the coal industry and jeopardise its recovery efforts.

However, the CEGB yesterday insisted that before the private generating companies could enter long-term commitments to British Coal they would first have to secure their own supply contracts with their customers, the 12 area boards that will distribute electricity.

Mr John Baker, the CEGB managing director for corporate affairs, said talks would start in the autumn between the commercial directors of the future generating companies and British Coal and other coal suppliers.
Source: Financial Times

Fawley B
Design contract awarded

The Central Electricity Generating Board (CEGB) has announced that the contract for the design, manufacture and erection of two 900 MW turbo-generators for the proposed Fawley B Power Station on Southampton Water has been awarded.*

The contract will be undertaken in two phases. The first phase is for the detailed design of the plant and will be placed shortly. The second phase is for manufacture and erection and is conditional upon the necessary consents being obtained to build Fawley B and a decision by CEGB's successor companies to proceed with the project.

Fawley B is a new design of coal-fired station planned to come into service in the mid-1990s where it would provide much needed additional generating capacity in the south of England.
Source: CEGB

*To GEC Turbine Generators

Fast reactor fuel
From any source

The United Kingdom Atomic Energy Authority's (UKAEA) prototype fast reactor (PFR) at Dounreay in Caithness is the only nuclear facility in Europe capable of accommodating large amounts of fast reactor fuel from other countries for periods long enough to burn up to 20% of their atoms by fission.

The reactor's most important function is to demonstrate the performance of future fuel designs on a large scale. The original target for standard PFR fuel was to 'burn up' (consume by fission) 7.5% of all the heavy atoms (plutonium and uranium) it contains.

As the fuel burns up, it becomes less effective, and the reactor power has to be adjusted with control rods, but this is limited. The PFR design allows more fuel elements to be added to the core to compensate, enabling a much larger adjustment to be made over a long period.

Another feature of the PFR is that it will take full commercial size fuel elements, for example those designed for the French SuperPhoenix reactor.

The PFR can also accommodate fuel pins of various diameters at optimum conditions while still optimising reactor power output, by careful location within the core. The PFR is able to irradiate the whole range of European fast reactor fuel designs under realistic conditions, making it a unique European facility for fuel development.
Source: UKAEA

PWR application
For Wylfa

Following meetings with local authorities in North Wales and Suffolk the Central Electricity Generating Board (CEGB) today confirmed its intention to apply, later this year, for consent to build a pressurised water reactor (PWR) power station at Wylfa on Anglesey, North Wales, and to carry out site investigations at Sizewell in Suffolk for a possible C station. The proposed Wylfa B would be built on land adjacent to the existing magnox power station and have an output of 1200 MW.

At Sizewell, the site investigations and other studies will look into the suitability of land immediately to the north of the Sizewell B PWR which is currently under construction.

Wylfa B would follow Sizewell B and the proposed Hinkley Point C PWR in Somerset for which the Board has applied for consent. The design of Wylfa B would replicate both Sizewell B and Hinkley Point C. It is unlikely to require any new transmission lines across Anglesey, although some developments to the existing transmission network on the mainland would be necessary.

Detailed discussions on Wylfa will take place between the Board and various interested parties. This will enable a detailed environmental statement to be published. This will describe the project, an assessment of the significant environment effects and an outline of measures to be taken.

At Trawsfynydd, no technical factors have been found so far to rule out the development of a PWR. But the Board intends to hold further discussions with Gwynedd County Council, the Snowdonia National Park Authority and others. In particular, it wishes to discuss the environmental implications of building in a national park and a requirement to extend Lake Trawsfynydd to provide additional cooling water in preference to building cooling towers.

The work at Sizewell and the further studies at Trawsfynydd will enable the Board to evaluate these sites along with Druridge, Northumberland; Winfrith, Dorset; and Dungeness, Kent for future PWR applications.
Source: CEGB

Radioactive waste
Deep site should go ahead

Nirex should go ahead as soon as possible with the various stages leading to the construction of a repository for the disposal of low and intermediate radioactive waste at the earliest possible date. This was one of the conclusions of the independent Radioactive Waste Management Advisory Committee (RWMAC) sub-group in its response to the Nirex proposals for deep site investigations.

The report of the RWMAC sub-group on Nirex proposals for deep site investigations welcomes the Nirex discussion document *The Way forward* which reviewed future policy for the disposal of low and intermediate level waste.

RWMAC's report gives an initial response to the issues for public discussion specifically raised by Nirex, and then examines some consequential issues which require further discussion. The report concludes with some recommendations for further action within the full consultation process.

RWMAC recommended that Nirex

carry through their programme of consultation and evaluation as quickly as possible but with time for careful multidisciplinary assessments. This entails Nirex acquiring and using expert advice, including independent reviews at all stages of preparation of selection of criteria and the subsequent design studies. RWMAC intend to participate in a continuing dialogue with Nirex at suitable stages in the process of consultation and evaluation.
Source: RWMAC

Sellafield
Another leak

British Nuclear Fuels admitted a new radioactive leak at its Sellafield reprocessing plant as environmentalists made fresh allegations over safety at the site reports the *Finanical Times*.

British Nuclear Fuels said that the allegations were made by two men who had been sacked for breaking rules.

The company said that the latest leak was caused by a faulty seal. Officials immediately closed off a section of the plant in Cumbria after plutonium nitrate escaped during a maintenance exercise.

BNFL promised a full inquiry into the incident. Such an inquiry is routine, as is the notification of ministers after any leak of radioactive material.

It also prompted renewed calls from safety campaigners for BNFL to shut down reprocessing at the plant until it is made completely safe.
Source: Financial Times

Legionnaires scare
Regular maintenance urged

Building services engineers involved in the design, commissioning, operation and maintenance of cooling towers and water systems are urged by CIBSE (Chartered Institution of Building Services Engineers) to stage their own enquiries into the safety of their installations.

Recent outbreaks of Legionnaires' disease at the BBC's Broadcasting House in central London have generated widespread concern. The BBC's own internal team and an independent committee of experts will be investigating the design and maintenance of the BBC cooling tower, referring to recommendations set out in official documents, including CIBSE's Technical Memorandum 13 *Minimising the risk of Legionnaires' disease*.

Dr Geoff Brundrett of the Electricity Council, chairman of the CIBSE task group on the disease, strongly advises an investigation into the design procedures of every cooling tower and water system, checking them against the methods set out in TM13. Now that the warmer weather is here it is essential that regular maintenance checks be made in accordance with recommendations outlined in TM13. Following the official rules will eliminate the presence of the Legionnella bacteria and as a result help to save lives.
Source: CIBSE

Buses and coaches
Picking up energy efficiency

The Bus and Coach Council (BCC) has published *A system manual for garage premises*, the second stage report of the energy management study managed by the Council for the Energy Efficiency Office.

The first report was published in October 1987 and was a general overview of the use and cost of energy in the bus and coach industry and an audit of current cost saving action, setting the scene for the successive stages of the study and their reports. The current report is a practical working document that will enable operators to establish monitoring and targeting procedures in their premises.

Energy Minister Peter Morrison launched the study; he said that £30 M of the industry's annual £300 M energy bill was related to premises. 'This manual', he said 'shows how to cut energy waste in premises. With very little effort or expense, savings of 10%–15% can be achieved. With greater investment much greater savings are possible.'

'If operators follow this manual on a step by step basis, they will unfailingly save a great deal of energy and so increase their profits' said BCC's project manager Paul Crowther.
Source: Bus and Coach Council

Oil recovery research
Attracts £180 000

Research at Bath University has attracted £180 000 worth of support from the EEC, BP, and the United Kingdom Atomic Energy Authority's Oil Recovery Projects Division.

The money will fund a three-year programme into new methods of recovering heavy crude oil from petroleum reservoirs in the North Sea being carried out by two chemical engineers, Dr Malcolm Greaves and Dr Robert Field. According to Dr Greaves 'British oil will run out in 10 to 12 years time. The UK, now a 60% exporter of crude oil, will become a net importer by the early 1990s and the price will go sky high.'

The UK is fortunate in that large new oil fields have been discovered in the North Sea, some containing as much as one billion barrels. Unfortunately this oil is heavy and very difficult to produce using traditional techniques.

The two researchers are working on a new technique called *in situ* combustion (ISC), a complex process for the recovery of both heavy and light crude oil. The technique is to use pure oxygen to drive a combustion front through the oil reservoir's porous rock, thereby raising the temperature of the oil and causing it to flow. 'The trick is to burn only a fraction of the oil', says Dr Greaves.

At present the work at Bath is being conducted at low pressures using a combustion tube system to stimulate oil reservoir conditions.

The new programme — geared to develop a high pressure combustion tube facility, fully automated and capable of using pure oxygen — will be one of the most advanced facilities in the world.
Source: University of Bath

US/Oz
Cooperate on energy research

Australia has taken the first step towards cooperation with the United States in alternative fuels and oil-shale research.

The Australian Minister for Resources, Senator Peter Cook, said in Canberra earlier this year that he had signed a Memorandum of Understanding on energy research and development cooperation with the US Secretary for Energy, Mr John Herrington. 'Given our declining reserves of oil and the prospect for increasing reliance on imports for both countries it is both efficient and economical to increase the effectiveness of our respective energy research and development programme through greater collaboration,' he said.

'We are fortunate that Australia has abundant gas, coal and oil-shale resources which can be developed in the longer term to provide transport fuels.'

He said that cooperation with the US would help ensure that commercially competitive technologies were available when needed.
Source: Australian Information Service

(Continued overleaf)

Fuel cells
New US contract

In an effort to overcome the final economic hurdle to the commercial use of 'first generation' fuel cell power plants, the US Department of Energy has awarded a new research contract.*

The four-year, $8.6 M contract is to develop a more advanced, higher performance fuel cell for electric power generation that would be significantly cheaper to build and install than current technology.

Fuel cells use an electrochemical reaction, rather than combustion, to generate electricity and heat. Since they combine high efficiencies with virtually no on-site pollutant releases, fuel cells have long held promise as a clean power option for utility power plants or industrial cogeneration.

Yet, while early versions of the technology have reached technical maturity, fuel cell manufacturers have been unable to attract significant interest from the electric utilities in the US (sales of fuel cell stacks to utilities in Japan and Italy have been reported.) A Department of Energy report to Congress in April cited the high current price of fuel cells as the principal reason for the lack of commercial purchases by the domestic electric utility industry.

To compete with other energy sources, the initial installed costs of a fuel cell power plant will likely have to be in the range of $1500 to $2000/kW of electricity generated. Current costs are well in excess of that economic threshold. Overcoming the price barrier will require a combination of technological advancements and the improved economics of mass production volume.

To improve the technology it is intended to boost the power produced for a given size of a phosphoric acid fuel cell by 20% or more. Phosphoric acid fuel cells are so named because they use phosphoric acid to convey electrical charges between electrodes in much the same way a car battery uses dilute sulphuric acid. They are the most developed of the different fuel cell technologies. The current state-of-the-technology produces about 145 W/sq ft of cell area.

Boosting the power density and reducing material and processing costs would lower the cost of manufacturing fuel cells, perhaps by as much as 25%, and thus would reduce the capital costs of installing a fuel cell power plant.

Under the contract one small, developmental fuel cell stack and two stacks that are each 10 sq ft will be built. A stack is the core of a fuel cell module. Inside the stack, a hydrogen-rich gas made from natural gas or coal gives up its chemical energy in the form of electrical current.

Each 10 sq ft 'Configuration B' stack will have about 30 cells hooked in series, much like a flashlight has several individual batteries or cells touching end-to-end. Both of the larger stacks will be tested for 1500 hours. A fourth stack will be constructed for long-duration testing under a separate contract with the Electric Power Research Institute.

Source: US Department of Energy

*International Fuel Cells, Connecticut

FBC
Erosion research

The fluidised-bed coal combustor has been one of the major success stories of government-sponsored energy research in the United States. One problem that continues to plague these combustors, though, is the erosion of the boiler tubes that run through the churning coal particles inside the combustor.

The US Department of Energy has joined seven other organisations in a three-year effort to investigate the erosion problem.

A Memorandum of Understanding forms the basis for the cooperative research effort, which will be different from most federally-funded research. Rather than pooling their funds in a single research effort, each of the organisations will be responsible for a specific aspect of the research programme. Each participant may conduct the research itself or may contract with another party to perform the work.

The seven organisations are the State of Illinois' Centre for Research on Sulphur in Coal; US Department of Energy's Argonne National Laboratory; the Electric Power Research Institute of Palo Alto, California; Combustion Engineering; Foster Wheeler Development Corporation; ASEA Babcock PFBC; and the Tennessee Valley Authority, Chattanooga.

'The nature of the cooperative effort will allow for more research to be done than if government funds alone were used,' said J Allen Wampler, the Energy Department's assistant secretary for Fossil Energy. 'Each of the participants brings a different perspective and goal to the programme. For EPRI and TVA, the programme will help accelerate the introduction of fluidised-bed technology into the utility market, while Illinois will see benefits from a technology that can boost the use of its high-sulphur coal resources.'

The cooperative approach to resolving this problem grew out of a metal wastage programme plan proposed to the Energy Department by Argonne National Laboratory.

Each participant will support $75 000 of research each year for the three years. The Energy Department will match the funds contributed by the other participants up to a ceiling of $500 000 per year. A steering committee made up of a representative of each organisation will guide the selection of research tasks and will oversee the expenditure of funds. Although the Steering Committee may select whatever tasks it feels will be most beneficial, the programme plan developed by Argonne is expected to guide at least the early stages of the work.

The joint programme will focus on the bubbling bed version of the fluidised-bed combustor technology. The technique permits efficient combustion of the coal and permits substances such as limestone to be added to the bed to absorb the sulphurous gases given off by the coal-burning process. The bubbling action, however, erodes the metal from the boiler tubes that run through the bed, shortening their life. The problem occurs in fluidised-bed combustors that operate at atmospheric pressure and those that operate at elevated pressures.

A final report for each task will be published that describes the task activities, including findings and recommendations. Periodic progress, reports will also be made public. Although the primary purpose of the programme is not to develop patents, provision is made to protect technology developed by the participants.

Source: US Department of Energy

India
To reduce oil imports

India aims to reduce its dependence on imported oil, currently accounting for 30% of the country's total consumption, by developing its natural gas fields and improving gas production. The World Bank is supporting the Government's efforts with a $295 M loan.

Production from India's oil fields is reaching a plateau at a time when industry is demanding more energy. India will be more able to meet demand by tapping into abundant natural gas reserves — estimated at 570 Mt of oil.

The loan will finance measures to expand the country's gas markets and boost the capacity of India's Oil and Natural Gas commission and the Gas Authority of India to draw up plans for economical and use of gas resources.

A pipeline to be constructed between

(Continued on p23)

the offshore gas field at Heera to the mainland, along with new processing facilities, is expected to increase production from 10 M to 20 M m^3 of gas a day.
Source: World Bank News

Energy management
Hospitals benefit

Two major acute hospitals in North West Thames Region are to get new energy systems in a pilot contract energy management scheme.

In one scheme — at the Queen Elizabeth II hospital, a 400 bed general hospital run by East Hertfordshire Health Authority the energy management company* will not only install the system but will also be totally responsible for operating, servicing and maintaining all the energy services over the next 10 years. Installation costs will be £854000.

At the 539 bed Ashford Hospital, the large central boilerhouse will be decentralised with the installation of a more energy efficient plant, backed up with a comprehensive computerised energy management system which can accurately monitor and control the operation.

The contract at Ashford will run for 12 years, and the District Health Authority, Hounslow and Spelthorne, will remain responsible for maintenance.

The Ashford system will come on stream first. It will be operational by November of this year, while the QEII system will come on stream in 1989. Both health authorities will pay the company an annual amount equivalent to their historical energy costs, and the benefits of the energy savings will be shared between the company and the NHS.

North West Thames Regional Health Authority's director of Estate Development, Roger Johnson, said: 'We have estimated that we could save between 20 and 30% on our use of energy in many of our large hospitals if we could invest in the latest modern boilers, energy systems and computer controls.

'But we have not had the capital to put into these schemes. Now, by working in partnership with private sector companies we can generate the investment we need to turn these savings into reality, as well as equipping our hospitals with the most efficient energy systems well into the next century.'
Source: Emstar

Morocco
Improved electricity distribution

Morocco will improve and expand its electricity distribution system with the help of a $90 M World Bank loan. About 90 000 new customers are expected to benefit from the project.

The project will assist in rehabilitating, upgrading and expanding the power facilities of the Office National de l'Electricité (ONE), and five local utilities.

The project, part of the investment programmes of ONE and the five participating utilities, will be implemented during 1988–94. It includes technical assistance to help strengthen management, planning and technical capabilities.
Source: World Bank News

*Emstar

The Engineering Council
Six new members for Engineering Council

Six new members for the Engineering Council were selected for a three-year period at the Council's annual meeting on 17 May 1988. They are:

☐ *Mrs Christine Bowering* MA (Cantab); headmistress of Nottingham High School for Girls.

☐ *Prof John Caldwell* OBE DSc FEng FRINA; head of the School of Marine Technology, University of Newcastle upon Tyne.

☐ *James Dowd* CEng MIMechE MIProdE; principal of Oldham College.

☐ *Anthony Gill,* BSc (Eng) FEng FCGI FIMechE FIProdE; chairman and chief executive, Lucas Industries.

☐ *Mrs Kathleen Levine* BSc MBCS; associate dean and short courses manager at Hatfield Polytechnic.

☐ *Michael Manzoni* MA CEng FICE; managing director of R M Douglas Construction, Erdington, Birmingham.

CBE honour for director general

Dr Kenneth Miller FEng has been appointed a Commander of the Order of the British Empire in the Queen's birthday honours on 11 June 1988 (see Special Announcements, page 27). Dr Miller was appointed the first director general of the Engineering Council on 1 July 1982. He retires from the post at the end of July this year.

During his term of office, the Engineering Council has raised the profile of engineering and technology in the United Kingdom and heightened the awareness of the importance of engineering and technology to the nation's economy. It has been responsible for persuading Government to increase significantly the number of places for engineering students in universities and polytechnics and for knitting together the 48 professional engineering institutions and through them establishing the standards for the education, training and responsibility levels for the qualification of engineers and technicians.

Helping entrepreneurs to get companies 'off the ground'

It is all too easy for an entrepreneur faced with the pressures of getting a small company 'off the ground' to put off contacting the many sources of help and advice which are now available.

HRH The Prince of Wales says this in a foreword to a booklet *Innovators need more than ideas!* published in May by the Engineering Council.* The booklet encourages inventors entering for The Prince of Wales Award for Industrial Innovation and Production to seek help and advises them on how to get it.

The Prince of Wales, pointing out that the primary aim of the Award is to encourage British innovators to build successful businesses, adds: *'I welcome the work of the Engineering Council in putting together a brochure which not only highlights the issues British innovators should be thinking about, but also points them in the directon of people who are willing and able to provide a helping hand.'*

The Award, organised by the Engineering Council, is open to a wide range of people and organisations who are attempting to create profitable businesses based on British inventions or new ideas. The aim is to identity new products and processes and encourage the inventor or entrepreneur to get them into production and on to the market as soon as possible.

Innovators need more than ideas! gives advice on finance, design, marketing, sales and distribution, business partners, planning, commercial and technical support. The booklet is published with the support of British Venture Capital Association, Business in the Community and the United Kingdom Science Park Association.

*The booklet *Innovators need more than ideas!* is available free from: The Prince of Wales Award for Industrial Innovation and Production, Engineering Council, 10 Maltravers Street, London WC2R 3ER (tel 01-240 7891)

Royal award goes to surgeon-inventor

A plastic surgical retractor, invented by surgeon *David Sharpe* OBE, is the winner of the 1988 Prince of Wales Award for Industrial Innovation and Production, organised by the Engineering Council.*

The award goes to Mr Sharpe and to Jones Garrard Design Consultants who developed the invention.

Retractors, which are normally made of stainless steel, are used to hold back the edges of a wound during an operation — essential to give the surgeon a clear view. The Steritractor, a disposable plastic tool, has a special adhesive which sticks to any shape surface, and any part of the patient, thus freeing a pair of hands that would normally be needed to hold it. The Steritractor, now being exported to 21 countries, is unique and is being used not only in operating theatres, but in casualty departments and cottage hospitals, where small-scale operations are performed without surgical assistants.

Industrialist to head training pilot schemes

Derek Kingsbury CBE FIEE, a Chartered Engineer, chairman and chief executive of Fairey Group, has been appointed chairman of the Engineering Council's pilot scheme steering committee on continuing education and training. He is a member of the Review Board for Government Contracts and is a former member of the Council of the Confederation of British Industry.

The steering committee, which is being set up, will consist of employers, educationists and members of the engineering profession. It will prepare the way for a national system of continuing education and training in which engineers will draw up Career Action Plans in conjunction with their employers and, where necessary, their professional institutions.

Pilot schemes will be operating in large firms by the autumn, assisted initially by £170 000 from the Department of Education and Science

*Details and application forms for next year's Award will be available in September from the Prince of Wales Award for Industrial Innovation and Production, Engineering Council, 10 Maltravers Street, London WC2R 3ER (tel 01-240 7891)

PICKUP programme. The industrial organisations which have expressed an interest in taking part are: *APV, Barr and Stroud, British Aerospace, British Airways, British Gas, British Nuclear Fuels, British Petroleum, Building Design Partnership, CAP Scientific, Design Group Partnership, Electrolux, Fairey Group, Ferranti Defence Systems, GEC Telecommunications, IBM (UK), ICI, National Housing and Building Council, Ove Arup, Portsmouth Engineering Training Association, Rolls-Royce Motors, Scott Bader Co, Securities Technology, STC Telecommunications, Thorn EMI Electronics.*

Bernard Dawkins, the Engineering Council's continuing education and training executive, and *Chris Senior*, the co-ordinator, will be staffing this activity and will negotiate with companies on how to implement the pilot schemes.

Balanced science teaching

The first joint meeting of local education authorities to discuss balanced science teaching in schools was held in Cobham, Surrey, on 25 May 1988.

Employers, chief education advisers from five local education authorities and senior careers representatives discussed the teaching programme under which children take a science course that includes physics, chemistry and biology. The course takes about 20% of school time and can earn two GCSE subject grades. The meeting, sponsored by the Engineering Council and Shell UK, was called to explain the programme to employers in the region and win their support.

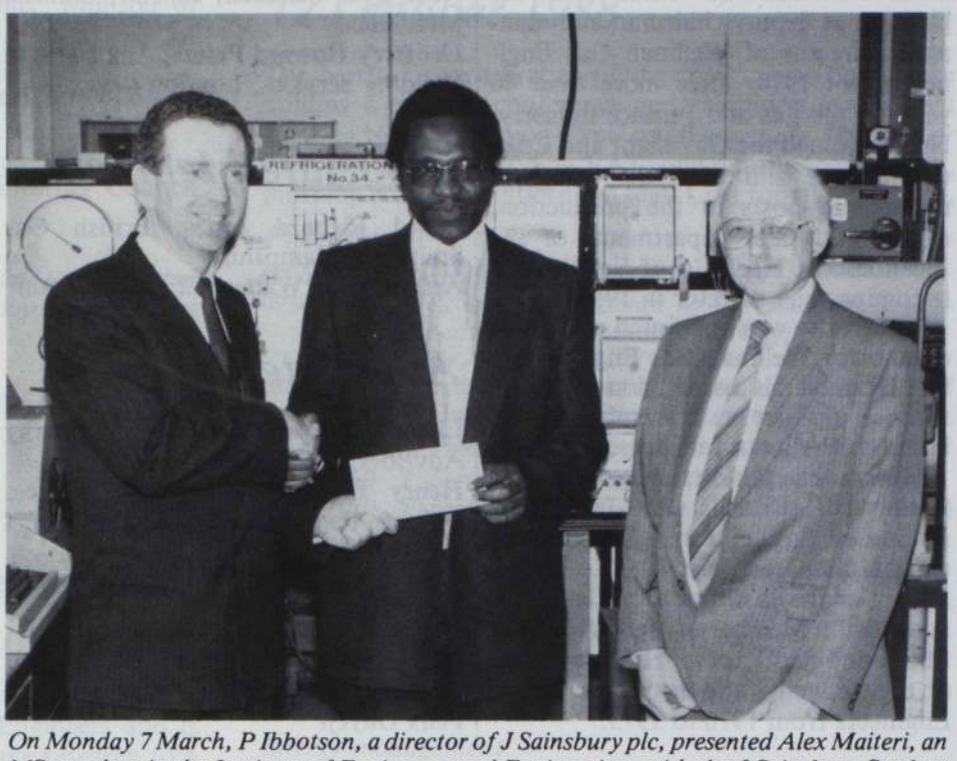
Brian Cook, of Shell-UK, said at the meeting: 'Every employer must be interested in having a well-educated body of employees with scientific knowledge. Many employers are concerned that too few people have scientific knowledge and too many children give up science at an early stage. Balanced science offers a way of making science a more attractive option to young people and so keeps the science/technology option open to a later stage.'

The balanced science curriculum keeps job and career opportunities open for all students, particularly girls. It increases the pool of students available for science, technology and engineering related employment and it helps to create over a period of time a scientifically and technologically literate society.

In 1987 a statement of support published by the Engineering Council and the Secondary Science Curriculum Review to bring about a broader, balanced science education for all youngsters up to the age of 16 was backed by 14 other national organisations; the number of organisations supporting the statement has now risen to 25, and includes the Royal Society, the Institute of Physics and the Royal Society of Chemistry.

Local education authorities who took part in the meeting were the Boroughs of Kingston-upon-Thames, Merton, Richmond-upon-Thames and Hounslow, and Surrey County Council.

Polytechnic of the South Bank: The J Sainsbury Student Prize presented by the Institute of Energy



On Monday 7 March, P Ibbotson, a director of J Sainsbury plc, presented Alex Maiteri, an MSc student in the Institute of Environmental Engineering, with the J Sainsbury Student Prize, which is presented annually by the Institute of Energy. The prize is given for the best all-round performance based on course work, examinations and project, in the MSc Environmental Engineering degree course. (Left to right): Peter Ibbotson (J Sainsbury plc); Alex Maiteri (prizewinner); Dr Geoff Leventhall (head of IoEE)

Personal

Sir Kenneth Couzens, a deputy chairman of British Coal, succeeded James Cowan CBE as chairman of Coal Products on 1 June 1988. He is also at present chairman of British Coal's Opencast Executive.

Dr Cecil French FEng, vice-chairman of the Sussex-based company, Ricardo Consulting Engineers, is now the 1988–89 president of the Institution of Mechanical Engineers. He took office at the Institution's annual meeting on 25 May 1988.

Barry Scott has been appointed chief economist at British Gas headquarters, London with effect from 1 May 1988. He is responsible for economic forecasting and for advising on the economic aspects of company policies such as pricing and investment.

Obituary

H D Napier (Professional Associate), a member of the North-Eastern branch, died on 7 June 1988. A fuller obituary will appear in a later issue of *Energy World.*

(Continued overleaf)

H C Newman (Fellow), a retired member of the Institute of Energy, died on 27 May 1988. He joined the Institute in 1944 and was an enthusiastic and active member for many years. Older members may remember him as a member of the organising committee of the conference on *The utilisation of natural gas,* held in Eastbourne in September 1968.

Mr Newman had retired from his position as deputy chairman and managing director of Wellman Gas Engineering in 1974, after more than 40 years in the gas and furnace industry. He had joined the Gas Light and Coke Co in 1933 and after the war held managerial posts in the production, export and sales departments of the Incandescent Heat Co of Smethwick, becoming sales director in 1959.

In 1969 he was appointed managing director of Wellman Gas Engineering, but retained his association with the furnace industry as a member of the board of Wellman Incandescent.

He was, in addition, a member of the Society of British Gas Industries, serving on Council for eight years and as chairman in 1969–70. He was a Fellow of the Institution of Gas Engineers and a Member of the Institute of Marketing and Export. He also served on the Council of the Institution of Gas Engineers from 1970 to 1973.

New members

Member

Michael James Bentley, Eastern Electricity Board, Luton *(transfer)*
Edward Lynn Elfed Evans, Foster Wheeler Energy, Reading
David Edward McSherry, British Coal, Middlesex, *(transfer)*
Neill Lyell Mitchell, Emstar, Staines, Middlesex
Geoffrey Howard Peters, Associates in Building Services, London *(transfer)*

Associate Member

David Richard Jones, British Gas Southern, Hampshire
Arthur Clive Walter, CEGB, London

Associate

Linda Brooks, Pilkington Energy Advisors, Merseyside
Henry Elfyn Morgan, Post Office, Western Letter Satellite Office, Cardiff

Graduate

Richard Martin Healy, Associated Heat Services, London *(transfer)*
Felix Onyeji

Student

Ivor Douglas Catto, Aberdeen Technical College
Andrew Winship, Leeds University

Institute of Energy *1988 Branch conferences*

South Coast

8 Sept (Th). One-day symposium: *NO_x generation and control in boiler and furnace plant*. The Crest Hotel, Southsea. In association with the Combustion Institute (UK section). Contact Dr M R I Purvis (tel 0705 827681).

North-Eastern

12 Oct (W). One-day energy conference and exhibition: *Energy efficiency in buildings*. Civic Centre, Newcastle upon Tyne. Contact M G Burbage-Atter (tel 0642 218121). See p27.

The Queen's birthday honours

We congratulate the following whose names appeared in the list of the Queen's birthday honours:

Privy Councillor

Peter Hugh Morrison MP, City of Chester, Minister of State, Department of Energy.

KCB

Peter Lewis Gregson, Permanent Under-Secretary of State, Department of Energy.

CBE

Dr K A G Miller, director-general, Engineering Council (see page 24).

Members who receive awards in honours lists are reminded that they should let staff at the Institute know as soon as possible so that records can be altered.

The Corbet and Henry Woodall and William Cartwright Holmes postgraduate scholarships

Applications are invited for this scholarship, which is administered by the Institution of Gas Engineers and is intended to provide admission to undertake research to a PhD in the Department of Fuel and Energy, the University of Leeds. The research topic can be on any aspect concerned with the application of new technologies for the utilisation of natural gas. Candidates should have or expect to obtain first of second class honours degrees in engineering or science. The value of the scholarship is equivalent to that of an SERC studentship and is applicable for three years.

Applications stating qualifications and experience, together with the name of a referee, should be sent directly to Prof A Williams, Department of Fuel and Energy, Leeds University, Leeds LS2 9JT. Further information can be obtained by telephoning Prof Williams (0532) 332508.

1988 Constructive Individuals training course

The course organised by the company, Constructive Individuals, lasts three weeks and by the end of it the trainees will have learned a wide range of skills and *will have built a four-bedroomed detached house*. The project takes place at Hindhead, Surrey in August, and a few places are still available. Cost: £300.000 (inclusive of food, on site accommodation, instruction and notes). Constructive Individuals have previously built at the Energy World show at Milton Keynes in 1986, and in 1987 at Sedlescombe Vineyard in Sussex for the vineyard owners.

Further information from Melanie Curtis, press co-ordinator, 4 Thackeray Road, Portswood, Southampton SO2 1GT (tel 0703-671179).

North Eastern: Energy efficiency in buildings Newcastle upon Tyne, 12 October 1988

The North-Eastern branch of the Institute of Energy are holding a one-day conference and exhibition at the Civil Centre, Newcastle-upon-Tyne on *Wednesday 12 October 1988*. Cost: £40 (including VAT, one set of papers, lunch, morning coffee and afternoon tea). Cost for students: £20.

Programme

0900–0930 Reception desk open for delegates.
0930–0935 Welcome to conference by the chairman, North-Eastern branch, Institute of Energy, *M G Burbage-Atter*.
0935–0950 Introduction to morning session, by the president of the Institute of Energy, *C E Pugh CBE*.

Designing for energy efficiency

0950–1010 Paper 1 *Prof O'Sullivan* (University of Wales).
1010–1030 Paper 2 *Dr T J Wiltshire* (University of Newcastle upon Tyne).
1030–1050 Coffee.

Energy efficiency projects

1050–1120 Paper 3 *B Wright* (J Sainsbury).
1120–1140 Paper 4 To be arranged.
1140–1210 Discussion on morning papers.
1210–1400 Lunch.

Energy management

1400–1420 Paper 5 *B Leighton* (Argyll Stores).
1420–1440 Paper 6 To be arranged.

The way ahead

1440–1510 Paper 7 Dr H Damskin (BRECSU).
1510–1525 Tea.
1525–1555 Discussion on afternoon papers.
1555–1600 Closing remarks.

Further information from M G Burbage-Atter, Teesside Polytechnic, Department of Civil and Structural Engineering and Building, Middlesbrough, Cleveland TS1 3BA (tel 0642 218121).

Engineering Industries Association

1. *Engineering trade mission to Bulgaria*

The National Westminster Bank are sponsoring an engineering trade mission to Bulgaria from 7 to 12 November 1988. The mission is being organised by the Engineering Industries Association (EIA).

Bulgaria has had one of the most successful economic growth records in the Eastern bloc. The 1986–90 Plan targets growth at 5.4% pa and for 1988 Bulgaria seeks an increase in national income of 6.1%. The country's enthusiasm for change has made Bulgaria one of the most exciting of the Comecon Group. Whilst its economy is one of the smallest of the Comecon countries, its willingness to try new financing techniques has thrown up many opportunities for British exporters. Bulgaria is a natural target market for the engineering industry because the most

important areas of its industrial sector are mechanical engineering, electrical engineering, electronics and robotics.

NatWest Bank are offering a grant of £235 towards the costs of each company on the Mission. The group travel package arranged by EIA costs £376, inclusive of five nights hotel accommodation in Sofia. Applications to join the Mission should be sent to EIA before *5 August 1988.*

2. *British Pavilion at* Energy economy 88

The Engineering Industries Association (EIA) are organising a group pavilion for British companies at *Energy economy 88,* the 3rd international energy economy exhibition being held at the RAI Centre, Amsterdam, Netherlands from 21–24 November 1988.

The exhibition will feature equipment, materials and services covering all aspects of energy-saving systems including *turbines, boilers, generators, measuring and control systems, safety devices, switchgear, distribution systems, total energy modules, heat pumps, heat regeneration equipment, cooling systems, no break installations and energy control equipment.*

The EIA's stand shell scheme will cost £75/m² and represents a considerable saving to individual exhibitors. In addition, economical group freight, travel and on-site services will be available through EIA. Application to participate must be made before *31 August 1988.*

The exhibition is held simultaneously with an important conference featuring combined heat and power generation, environmental problems associated with power generation, modern maintenance practice and replacement of existing plant. The conference attracts a high level of speakers and delegates and this year will include three days of specific input on the theme *Energy supplies — today and tomorrow.*

Further information on both these items from Anna Small, export director, Engineering Industries Association, 16 Dartmouth Street, Westminster, London SW1H 9BL (01-222 2367).

ASME international solar energy conference: San Diego (California), 2–4 April 1989

Aspects to be covered in this conference organised by the Solar Energy Division of ASME include:

- ☐ *Application in space of solar energy*
- ☐ *Biomass energy and combustion*
- ☐ *Concentrating solar collector technology*
- ☐ *Direct contact heat exchangers*
- ☐ *General topics*
- ☐ *Heating and cooling*
- ☐ *Passive solar energy and building, energy conservation*
- ☐ *Photovoltaics*
- ☐ *Solar energy systems, impact on utilities*
- ☐ *Simulation, modelling and optimisation*
- ☐ *Solar ponds*
- ☐ *Solar thermal power, components and systems*
- ☐ *Testing and measurements*

Further information from Paul Drummond, director of International Affairs, ASME, 345 East 47th Street, New York, NY 10017, USA (tel 212-705-7153; tlx 710-581-5267).

College of Petroleum Studies Courses: Oxford, September 1988

The following courses have been arranged for September 1988:

5–9 September	A five-day course in Oxford. *Trends, developments and economics in retail petroleum markets.* Course code RM1.
12 and 13 September	A two-day course in Oxford. *Petroleum products and aviation industry.* Course code IM1.
14–16 September	A three-day course in Oxford. *Marketing petroleum fuels to industry and commerce in a changing environment.* Course code IM2.
19–23 September	A five-day course in Oxford. *LPG — supply, economics, markets and international trading.* Course code TR2.
26–30 September	A five-day course in Oxford. *Practical aspects of tanker chartering and supply operations.*

Further information from College of Petroleum Studies, Administrative Offices, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD (tel Oxford (0865) 250521; tlx 838950 COLPET-G or 83147 VIAOR Ref COLPET).

Autumn 1988 courses: KBC Process Automation

Full details are now available of KBC technical courses scheduled to be run in September, October and November 1988. KBC offer a wide range of training services to the oil, petrochemical and chemical process industries.

Please contact Sheelagh Allan, course co-ordinator, KBC Process Automation, Chilworth Research Centre, Chilworth, Southampton SO1 7NP (tel 44-703-760111).

Awards:

1. *Midlands Electricity Board's Special Award scheme*

The Midlands Electricity Board has announced a Special Award scheme for business performance and efficiency. This new Award, the *MEB Advanced Technology Award,* is run in parallel with the national *Power for Efficiency and Productivity (PEP) Award* scheme.

The PEP Awards are designed to promote efficient and productive use of electricity and to encourage companies to improve business performance in terms of total sales or exports or a reduction in unit costs by using the latest electrical technology. The new Award is open to any business, large or small, which is a customer of the Midlands Electricity Board, including those organisations which supply advisory or consultancy services to manufacturing

industry. The new Award could be based on a contribution made towards novel uses of electricity or significant advances in the technology.

To enter for the PEP Awards, a manufacturing unit has to demonstrate real benefits from an electrical process. The MEB Advanced Technology and PEP Awards are based on achievements by entrants in five main areas:

- ☐ Decrease in energy per unit of production
- ☐ Improvement in product quality
- ☐ Improved working conditions
- ☐ Improved business performance in sales or exports
- ☐ A reduction in unit production costs

There are two basic categories for the PEP Awards:
Category 1 — for business units with up to 100 employees.
Category 2 — for units with over 100 employees.
Winners of the MEB PEP Awards will receive an Eta trophy and £1000. The Advanced Technology Award includes a trophy and a cash prize of £500.

Further information from Bill Watson or Jim Carrington, Energy Marketing Headquarters, Midlands Electricity Board, Mucklow Hill, Halesowen, West Midlands B62 8BP (tel 021-422 4000).

2. *International UNIPEDE Eta Awards*

New international awards for the outstanding application of electrical processes or services to improve business performance have been announced: the *International Union of Producers and Distributors of Electrical Energy (UNIPEDE) Eta Awards*. The Awards carry top cash prizes of £2000 and will be presented at the 1991 UNIPEDE congress.

To qualify, companies in UNIPEDE member countries are asked to submit an entry describing in not more than 1000 words how their business has profited from improved electricity utilisation in one or more of the areas listed above for the MEB Advanced Technology and PEP Awards. The Awards will also be made in the same two categories: one for manufacturing units employing up to 100 people and the other for manufacturing companies employing more than 100 people.

Each country will issue an Award to one winner and certificates of commendation to two runners-up in both categories. These will then be judged to select the best example in each category internationally, who will each receive a cash prize equivalent to £2000. In addition to the Awards — in the form of a world globe surmounted by the Greek letter Eta, the mathematical symbol for efficiency — the winning companies will have the right to use the UNIPEDE Eta Award symbol on company stationery, literature and promotional items.

Further information from the Electricity Council, Public Relations, 30 Millbank, London SW1P 4RD (tel 01-834 2333 ext 6490/6270).

3. *Better Environment Awards for Industry 1988*

Four Awards for contributions to environmental protection are to be made available during 1988 to British companies, research and educational establishments, and individuals working with industry. Following the success of last year's Awards, presented by HRH The Prince of Wales, with entries going forward to the European-wide scheme, the same format will be continued for 1988.
Awards:

- ☐ *The Pollution Abatement Technology Award* will be given for the development and adoption of technologies which reduce the harmful impact of industry on the environment.
- ☐ *The Green Product Award* will be given for products, already on the market or prototype-tested, which have incorporated environmental considerations into the earliest stages of planning and design.
- ☐ *The Environmental Management Award* will be given for the integration of environmental considerations into overall corporate or site management policy.
- ☐ *The Appropriate Technology Award* will be given for environmentally sound technological innovations specifically adapted to the needs of developing countries.

Further information from Margaret Peach, Awards administrator, RSA, 8 John Adam Street, London WC2N 6EZ (tel 01-930 5115). Closing date for entries *1 September 1988*.

British-Soviet Month, April 1989

In April 1989 the British-Soviet Chamber of Commerce are sponsoring *British-Soviet Month*. Eleven trade exhibitions will be held in the Moscow World Trade Centre during the month, covering *energy, chemicals/polymers, transport, agriculture, healthcare, communications, consumer products, engineering, construction, paper/printing and services.*

The event has the full support of the Department of Trade and Industry, who are making available contributions of over £1600 towards the costs of exhibitors who book by *23 October 1988*.

A series of cultural and sporting events will be taking place in Moscow, providing opportunities for part or full sponsorship. Seminars will also be held, at which exhibitors can arrange to read papers.

Early booking is recommended, to ensure stand space and to take advantage of the DTI financial support. Details and booking forms are available from the British-Soviet Chamber of Commerce, 2 Lowndes Street, London SW1X 9ET (tel 01-235 2423) and from the exhibition organisers, Barry Martin Group, Suite 343, Linen Hall, 162 Regent Street, London W1X 1RA (tel 01-439 1271).

REGISTER OF ENERGY COURSES

Course No 00–409

Title: Instrumentation measurement and control in chemical engineering.
Duration: 5 days.
Location: University of Leeds.
Starting: 12 September 1988.
Content: Automatic control: loop tuning. Control valves. Pressure measurement. Level measurement. Computer control. Computer interfacing. Temperate measurement. Flow measurement. Weight measurement. Online analysis. Intrinsic safety.

Course No 00–410

Title: Principles of fluidisation.
Duration: 3 days.
Location: University College, London.
Starting: 14 September 1988.
Content: Mechanism of fluid-particle interaction. Particulate-aggregate transition. Bubble hydrodynamics. Particle mixing. Reactor design and scale-up. Entrainment and elutriation. Heat transfer. Operation at high temperatures and pressures. Combustion. Pneumatic conveying. Diagnosis of plant problems. Granulation.

Course No 00–411

Title: Energy management.
Duration: 5 days.
Location: Portsmouth Polytechnic.
Starting: 19 September 1988.

Course No 00–349

Title: Combustion of solid fuels.
Duration: 1 week.
Location: The Netherlands.
Starting: 19 September 1988.
Content: Solid fuels: sources, properties and impacts. Combustion aerodynamics. Devolatilisation of solid fuels. Coal ignition and extinction. Gas phase combustion of volatiles. Heterogeneous char combustion. Fundamentals of NO formation and destruction (gas and solid phase). SO_x fundamentals. Further combustion generated byproducts. Thermal radiation in coal fired combustors. Mathematical modelling of coal fired combustors. Research in the area of solid fuel combustion. Technology and systems of solid fuel preparation. Pulverised fuel boilers. Non-utility application of solids combustion. Fuel related problems in boiler operation. Removal of noxious components from flue gases. NO_x abatement during combustion. Fluidised bed combustion. Removal of solids from flue gases. Byproducts of solid fuel combustion.

Course No 00–412

Title: Plant layout.
Duration: 5 days.
Location: The Stakis Victoria Hotel, Nottingham.
Starting: 16 September 1988.
Content: Layout principles. Layout exercises. Safety and emergency considerations. Explosion and fire effects. Release and dispersion calculations. Hazard assessment exercise. Product packaging and storage. Bulk solids handling. Batch and housed plants. Modular construction. Layout organisation. Computer-aided layout methods. Computer demonstrations and exercises. Area classification.

Course No 00–413

Title: Combustion fundamentals.
Duration: 5 days.
Location: Imperial College, London.
Starting: 26 September 1988.

CONFERENCES

August 1988

Use of computers in the coal industry

Fourth conference, Tuscaloosa (AL, USA), 8–10 August 1988.
Details from Richard Sanford, University of Alabama, PO Box 1468, Tuscaloosa, AL 35487-1468, USA (tel (205) 348-1686).

Underground coal gasification

14th annual symposium, Chicago (IL, USA), 15–18 August 1988.
Details from Antony S Wieckowski, Conference Services, Morgantown Energy Technology Centre, PO Box 880, MS L05, Morgantown, WV 26507-0880, USA (tlx 7019210313 DOE METC MORG; fax: (304) 291-4469).

Opportunities in the synfuels industry

Symposium, Bismarck (ND, USA), 28–31 August 1988.
Details from Fred Wittmann, symposium coordinator, Division of Continuing Education, University of North Dakota, University Station, Grand Forks, ND 58202, USA.

September 1988

International energy congress

Gold Coast, Queensland (Australia), 4–9 September 1988. *Sponsored by the Australian Institute of Energy.*
Details from Congress Secretariat, GPO Box 1334, Brisbane, Qld 4001, Australia.

The challenge of change

Sixth NEA energy projects conference, University of Nottingham, 5–8 September 1988.
Details from Neighbourhood Energy Action, 2nd floor, 2/4 Bigg Market, Newcastle upon Tyne NE1 1UW (tel (091) 261 5677). *All bookings for conference should be received at NEA by 31 July 1988.*

Drying

Sixth symposium, Versailles (France), 6–8 September 1988.
Details from Prof M A Roques, ENS des Industries Chimiques, 1 rue Grandville, 54042 Nancy, France.

Separation of gases

Fifth BOC Priestley conference, University of Birmingham, 19–21 September 1988.
Details from Dr John F Gibson, secretary (scientific), Royal Society of Chemistry, Burlington House, London W1V 0BN (tel 01-437 8656).

October 1988

Energy engineering

11th World congress, Atlanta (GA, USA), 12–14 October 1988.
Details from Association of Energy Engineers, suite 340, 4025 Pleasantdale Road, Atlanta, GA 30340, USA.

Building on expertise: the new momentum

Europec 88 (European petroleum conference 1988), London (Royal Lancaster Hotel), 16–19 October 1988.
Details from Gary D Achenbach, Conocol (UK) Ltd, Park House, London W1Y 4NN (tel 01-408 6449).

Coal research

International conference, Tokyo (Japan), 17–21 October 1988.
Details from Dr W G Jensen, International Committee for Coal Research, Avenue de Terveuren 168, Boite 11, 1150 Bruxelles, Belgium (tel (02) 771 99 74; tlx 24046 CEPCEO B).

Internal and external protection of pipes

Eighth international conference, Florence (Italy), 24–26 October 1988.
Details from conference organiser, 8th *Pipe protection*, BHRA, Fluid Engineering Centre, Cranfield, Bedford MK43 0AJ (tel (0234) 750422; tlx 825059 BHRA G; fax 0234 750074).

FGD and dry SO_2 control

Symposium, St Louis (Missouri, USA), 25–28 October 1988.
Details from Electric Power Research Institute, attn: Sharon Luongo, conference coodinator, 3412 Hillview Avenue, Palo Alto, CA 94304, USA (tel (415) 855-2010).

October/November 1988

Intelec 88

International telecommunications energy conference, San Diego (CA, USA), 30 October–2 November 1988.
Details from Norman Siomra, C&D/Charter Power Systems, 3043 Walton Road, Plymouth Meeting, PA 19462, USA (tel (215) 828-9000).

November 1988

The wider role of coatings in corrosion protection

One-day symposium, London (Royal Institution), 10 November 1988.
Details from J Tooth, secretary, London branch of Oil and Colour Chemists Association, 64 Ingrebourne Gardens, Upminster, Essex RM14 1BW (tel (040 22) 23444).

Energy 88

Symposium and exhibition, Barcelona (Spain), 14–16 November 1988.
Details from Omni-Expo SA, Case postale 271, CH-1211 Geneva 12, Switzerland (tel +4122 20 53 50; tlx 422.342 RB YB CH; fax +4122 299.224); *or* (UK) ADG Exhibitions, M Andrew Gillanders, Sycamore House, 1 Woodside Road, Amersham, Bucks HP6 6AA (tel (494) 729 406; tlx 837 593).

MESUCORA 88

International measurement and control exhibition, Paris (France), 14–18 November 1988.
Details from French Trade Exhibitions, Knightsbridge House, 2nd floor, 197 Knightsbridge, London SW7 1RB (tel 01-225 5566; tlx 269132 FRACOM; fax 01-225 5557).

Building industry convention

Royal Garden Hotel, London, 22–24 November 1988.
Details from Janet Marshall or Christine Hurst, Building Industry Convention Ltd, Pippingford Park Manor, Nutley, Sussex TN22 3HW (tel (082 571) 3277; tlx 957507 ILD G; fax (082 571) 2250).

November/December 1988

Polmet 88: pollution in the urban environment

Second international conference and exhibition, Hong Kong, 28 November–December 1988.
Details from Polmet 88 Secretariat, 9/F, Island Centre, No 1 Great George St, Causeway Bay, Hong Kong (tel 5-8954446; tlx 74679 BINHK HX; fax 5-777791).

March 1989

ProcAnEx 89

Exhibition of process and environmental analytical instrumentation, Manchester, 7–9 March 1989.
Details from Sara James, James (Exhibitions) Limited, 6 Anne Mount, 44 Madeley Road, London W5 2LU (tel 01-998 4684).

April/May 1989

FBC technology of today

International conference, San Francisco (CA, USA), 30 April–3 May 1989.
Details from Leslie Friedman, FBC conference co-ordinator, American Society of Mechanical Engineers (ASME), 345 East 47th Street, New York, NY 10017, USA (tel 212-705-7788; twx 710-581-5267).

New oil burner

GP Burners have introduced a new quality oil burner for domestic and smaller commercial and industrial applications. The MF1R has been designed for ease of installation and reliability and is suitable for Class 'D' oil or kerosine.

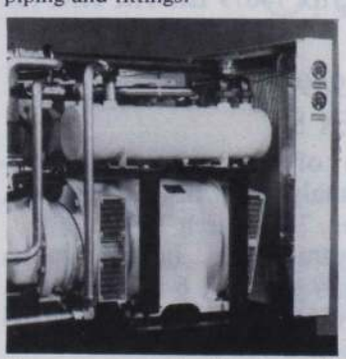
An interesting design feature is the combustion head which has been developed to ensure precise regulation and adaptability to operate with all known types of appliances giving high CO_2 levels. Regulation of the diffuser plate is by means of a screwed adjuster and indicator device which results in exact repeatability when the burner is being commissioned or serviced. The main air damper is profiled and has position indication. The MF1R will interface with most known standard control components and an integral terminal strip makes electrical connection safe and simple.

The MF1R is rated at 22 to 41 kW and come with its own outer casing, although as an option the burner can be supplied without casing if the unit is to be installed inside a boiler casing. A nozzle and flexible oil line are supplied as standard. Net weight is 14 kg and dimensions 36 × 31 × 46 cm.

Reader enquiry no 7/1

New energy recovery system

With the new energy recovery system (ERS) from **Ingersoll-Rand,** 80% of the energy used to compress air in the company's SRR range of rotary screw air compressors can be recycled in the form of heated water. The ERS can be installed in already commissioned compressors and the package includes an oil/water heat exchanger, support brackets, inlet and outlet water temperature gauges and all the necessary valves, piping and fittings.



Energy recovery system from Ingersoll-Rand

In the compressor, lubricating oil from the air end absorbs the heat of compression and enters tubes in the ERS heat exchanger, which consists of one or two shells and is placed in parallel with the oil cooler. By-passes in the ERS safeguard against over- or under-cooling the oil. When the oil temperature is too high, part of the oil is diverted through the oil cooler, ensuring that it enters the compression chamber at the desired temperature. Conversely, when recycled oil temperature is too low, oil by-passes both the oil cooler and ERS heat exchangers and is injected directly from the oil separator into the compressor air end. There are three types of ERS: normal water flow and temperature rise from 60–70°C; high water flow and temperature rise from 70–80°C; and low water flow and high temperature rise from 20–70°C.

Reader enquiry no 7/2

New engine range launched for construction market

3000 Series — a range of powerful eight and twelve cylinder diesel engines for construction equipment — has been launched by **Perkins Engines.**

The vee configuration engines — five of the range are eight cylinders and seven are twelve — have power outputs stretching from 3388 to 746 kW. They have been tailored for heavy construction and industrial equipment applications. An additional emergency power rating on the twelve cylinder unit of 719 kW is available for fire fighting installations.

With the addition of 3000 Series, Perkins now claim to have probably the most comprehensive range of diesel engines for construction and industrial applications available from a single source.

Reader enquiry no 7/3

Gas drier for low flame

Michell have introduced a high-performance gas drier for low flow applications. This has been designed for use typically in humidity calibration systems or as a source of ultra-dry gas in pilot-scale processing and research.

Designated the PSD-2, this new gas drier is a heatless pressure-swing unit and is capable of generating up to 7 litre/min at better than 75°C dewpoint at 0.75 bar gauge. It relies upon a large pressure drop in a pressure vessel containing 4A molecular sieve desiccant to draw off water from the passing gas stream. Two vessels operate in parallel, one generating dry gas while the other is regenerating. The changeover is effected by an electrical cam timer with a cycle period of one minute.

The PSD-2 is maintenance-free and will, it is claimed, operate for many years without the need to change the desiccant. It requires an AC mains supply at 100/120 or 220/240 V, 50/60 Hz, and a supply of clean, oil-free gas at a minimum pressure of 5 bar gauge, and a flow of 10 litre/min. Hosed in a 6U 19 in. sub-rack unit, it may be either rack or bench mounted.

Reader enquiry no 7/4

KCC win oilfield contracts

KCC Process Equipment have been awarded two contracts by Mobil Oil Company in Libya. Under the contracts, KCC will design, supply and commission an *amine gas sweetening plant* with associated utilities, and an 80 000 BPD, *3-phase production separator* with metering facilities. The orders were won against strong international competition and the equipment will be manufactured mainly in the UK.

The *MEA sweetening unit* is designed to remove up to 5% hydrogen sulphide from a fuel gas stream enabling the gas, which is currently being flared, to be used for power generation on existing gas turbines. The *3-phase separator* will be installed in an existing crude oil gathering centre as part of a long-term project to modernise and expand the facilities for increased oil production and recovery.

Reader enquiry no 7/5

STRAINERCYCLE free cooling system using Hydrogiene

Endless Energy claim that their hydrogiene system, developed from a number of their areas of expertise, can substantially reduce the risk of an outbreak of Legionnaires' Disease resulting from suspect cooling tower water.

The basis of the package of measures involved in a Hydrogiene package is:

1. The reduction of the temperature of all circulating water to a safe 10–12°C at reduced ambient temperature conditions.
2. The installation of high technology straining equipment to eradicate all water-borne contaminants over over 120 μm. This ensures the elimination of the vast bulk of any bacterium's food source.
3. Full circulation at all times of year to avoid stagnation and 'breeding grounds'.
4. A fully automated, computer controlled regime of water treatment and monitoring giving immediate alarm on important variables.
5. Retrofit of high quality drift eliminators to the cooling towers.

Endless offer a complete consultancy, design and installation service, and back their systems with a comprehensive monitoring service.

Reader enquiry no 7/6

New sterile water production technique

A new electrical technique can, it is claimed, cut hospital bills for sterile water by over 60% while maintaining the highest standard of patient care. The new technique can produce water of the required quality in the hospital itself for around 25p/litre from equipment smaller and easier to use than traditional methods.

The new technique uses a combination of ultraviolet (UV) light and ozone to eliminate bacterial debris, known as pyrogens, and produces water which conforms to the specifications required by the Pharmacopoeia for injectable water. The equipment is manufactured by the water treatment company, **Elga,** under licence from the Electricity Council, which developed the technology at their Research Centre at Capenhurst.

In the past both UV and ozone have been used separately to assist in the purification of water for drinking water supplies and specialised industrial purposes. For the first time, this radical technique, patented by the Electricity Council, exploits UV and ozone in perfect combination with a sterilising effect 1000 times more powerful than either UV or ozone alone.

Reader enquiry no 7/7

Energy monitoring and targeting

Copies of the TEAM computer program for energy monitoring and targeting are to be made available for use on training courses. The **Energy Auditing Agency,** who supply the software to local authorities and other major property owners, have agreed to provide a special version of it for the Energy Information Centre's popular one-day practical workshop *Managing energy with a desktop computer.* The EIC has organised 18 computer workshops in the first six months of 1988, at venues from Heathrow and Cardiff in the south, to Belfast and Edinburgh in the north, using the services of Vilnis Vesma (energy consultant).

Reader enquiry no 7/8

ENERGY WORLD — COMMERCIAL
(Photocopy acceptable)

Please send me further information against the reader enquiry no(s) listed below (please tick)

7/1 7/2 7/3 7/4 7/5 7/6 7/7 7/8

Name .....

Address.....

.....

Organisation .....