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Post-Chernobyl: the USSR energy prospects: an overview

Last month's Viewpoint, 'After Chernobyl', concluded that 'A great deal of international effort is required to ensure complete freedom of nuclear technology to be exchanged across national boundaries. The world powers could assist in bringing about an increased public acceptance by considerably increasing the powers of the International Atomic Energy Agency, so as to give public utilities everywhere, the support needed to gain acceptance.' That paragraph, we feel, stands repeating; and in that context, we publish here, not a 'viewpoint', but an overview through Sovosti Press Agency, of the current Soviet energy situation and aspirations post-Chernobyl, by Alexei Makuhin, the First Deputy Minister of Power Engineering and Electrification of the USSR.

The accident on the Chernobyl nuclear power station on 26 April, 1986, triggered suppositions in the West about the unreliability, or otherwise, of the Soviet nuclear power plants, and about the future of nuclear power engineering in the USSR.

The 30-odd-year history of nuclear power engineering in the USSR knows of no prior serious accidents entailing radioactive contamination. The Soviet NPPs have proved to be reliable and effective. The designs of the Soviet nuclear power plants and nuclear reactors boast a high technical level. Yet, nuclear power engineering is still very young. And any scientific and technical progress involves risk and possible failures. This is proved by the accident at the Chernobyl station, and by the record of nuclear power engineering in other countries. But failures involved in mastering nuclear energy shall not make us renounce that progressive line of power engineering.

As to the accident itself. The design of the plants of this type corresponds to the appropriate Soviet and international standards. There was no quality control over the production and assembly work. Consequently, the accident must have been caused by a freak coincidence of system failures. Conclusions will be drawn from the Chernobyl accident, and additional steps will be taken to raise the reliability of nuclear power engineering, which will further develop as planned.

Big nuclear power plants are to be built in the European part of the Soviet Union and in the Urals, where the fuel-energy resources are comparatively small. Meanwhile in the East thermal and hydropower plants are to be mainly erected. In 1990 the country is to produce up to 1840-1880 billion kWh of electric power, including up to 390 billion kWh by the NPPs.

To reach these targets, a number of issues will have to be solved and shortcomings eliminated. Among other things, capital investments must be used more fully, and labour force and funds to be channelled to major construction sites. Progressive methods of work organisation must be applied on all stages of plant construction. Thus, we have elaborated and introduced into practice the high-speed straight-line flow method of building NPPs with 1M kW generator units. The method has been used at the Zaporozhye, Balakovo and other NPPs. While the first generator unit took 63 months to assemble on the Zaporozhye NPP, the second took but 58 months, the best result for the industrially advanced countries.

Mostly 4-6 M kW NPPs with 1-1.5 M kW thermal reactors will be built. These reactors form the basis of modern nuclear power engineering. We also have fast reactors capable of nuclear fuel breeding. The biggest of them (600 000 kW capacity) is working on the Beloyarskaya NPP. The task now is to design 800 000 kW generator units with fast reactors, and solve the scientific and technical problems involved in making 5 M kW units.

Nuclear energy is also increasingly being used for heating. We are building the first big nuclear heat supply plants and thermoelectric nuclear plants (TNP). One 2 M kW TNP (such as are being erected near Odessa and Minsk) saves more than 4 Mt of liquid fuel per year, substituting for 10 low-efficiency air-polluting boiler rooms.

Large-scale construction of NPPs calls for developing power generators (like hydroelectric pumped storage power plants — HPSPPs) that could receive superfluous power from NPPs and TPPs to return it in peak hours, thus regulating loads in power grids. In 1986-1990 the 1.2 M kW Zagorskaya HPSPP near Moscow, and the 1.6 M kW Kaisiadorys HPSPP in Lithuania are to be put into operation. More powerful plants of this type will be built in Leningrad, on the Dniester river, and at the city of Kanev.

The more effective hydropower resources have been mostly exhausted in the European part of the USSR. But HPSPPs can be built there, since no large rivers are needed for them. Meanwhile Siberia, the Far East and Central Asia possess a colossal unharnessed river potential. Large hydro power plants are under construction there — the Rogunskaya (3.6 M kW), Boguchanskaya (3 M kW), Bureiskaya (2 M kW), and others. As little as 20% of the country's economically effective hydropower resources have been put to use so far. This percentage will increase to 40% in 1986-1990.

There are large coal deposits in the Soviet Union's East. It is unprofitable to transport coal over long distances from the Kansk-Achinsk (in the South of Siberia) or Ekibastuz (Northern Kazakhstan) basins. That is why large thermal power plants are being constructed in those coal mining areas. The new TPPs which are going up in Western Siberia will also use such local fuels as natural and waste gas. These TPPs will produce the country's cheapest electric power.

The higher efficiency of power production hinges on the acceleration of the scientific and technical progress. Technical retooling in 1986-1990

continued on p 12

Institute of Energy future conferences — see p 13

The whole city CHP assessments

P C Warner MA CEng FIMechE FInstE FBIM†

In the preamble to his address, P C Warner reminded members and guests that the connections between the Energy Industries Club and its ancestor, the Fuel Luncheon Club and the Institute of Energy, were close and long-standing and many there would have recollections about them that could cap anything he might say. So he would confine himself to saying that, he was honoured on behalf of the Institute of Energy, to have been invited, and he was quite certain that the relationship would go on for a long time, and would continue to be as fruitful as it always has been

You were kind enough in your invitation to say that I might choose my own subject, and as people from an engineering institution normally have two hats, I thought it might be acceptable if I talked to you about something that my company** is involved in, and that is Combined Heat and Power applied to whole cities.

CHP/DH is extensively adopted in other countries, especially Scandinavia, but the United Kingdom story started only in the mid-70s. After the Marshall Committee in 1979 the talk was of a 'lead city' for development and demonstration, and Government response spread over many years, until April 1984 when the Secretary of State for Energy called for local consortia with substantial private participation to put proposals for a study of CHP/DH in their city, to see if it could be financed in the private sector; up to three consortia would get half their costs to a maximum of £250 K.

The successful ones were Edinburgh, Belfast, and Leicester. We are members of the first two. We were also members of Tyneside, but that was not successful although it is a very good submission and there is a lot of enthusiasm up there, but obviously there had to be diversity in the awards.

We are now well into our work, and I would like to tell you about some peculiarities that take us beyond straight engineering.

I would like first to deal with some peculiarities in the administrative framework, for want of a better word. There are three: organisation, rates, and approvals. We are considering, remember, financeability from the private sector. That is the basis at present.

In its organisation, CHP is a mixture of two elements: the electricity supply industry, which we know, and some organisation (the Heat Board), beyond the power station fence, running the distribution system, the pipes and pumps and the heat-only boilers for peaking and standby, and marketing the heat. It might reflect both private and public interests, with due accountability and safeguards. Its functions are the design, construction, and commissioning of the city scheme; and later of possible extensions to it; and its operation and its maintenance. A critical requirement is to give confidence to prospective investors. The Marshall Committee had advocated an overall National Heat Board, apparently on an analogy with nationalised gas and electricity, but it is not a convincing one as no national heat network is contemplated: the individual city CHP/DH schemes are connected only through the electrical side.

There has to be a contract between the heat and

electricity organisations. But technically collaboration at arms length is not enough, for several reasons. The allocation of capital and operating costs common to electricity and heat involves continuing judgement. Also a CHP station has a place in the merit order that depends on the proportion of heat and electricity in its output. The operators are controlling plants, the heat-only boilers and the CHP sets, that are on both sides of the commercial boundary, and deciding which to start up and to what output. The control system has to be integrated.

The idea that the ESI just quotes for heat simply will not do. You would not get the optimum operation. It makes it complicated commercially, but it is our job to solve complicated problems, and we are fortunate that our consortia in Edinburgh and Belfast both contain the relevant electrical utility.

Local authorities have mixed interests because they are a major consumer through their council estates, offices, schools and public buildings; and they have their overall responsibility for the city and such matters as traffic and environmental health, etc.

Rating arises for the plant sites and for the distribution pipes. The present rules are complicated and I would not claim to understand them. There is a similarity between plant sites for CHP/DH and power stations; and between water pipes and gas pipes. Provisions for existing utilities took shape as electricity, gas or water gradually grew over the last 100 years and were consolidated in the General Rate Act 1967. The net effect seems to be one of some privilege. Without statutory change, CHP/DH therefore starts with a competitive handicap in the shape of a substantial rate bill.

As regards approvals, a CHP/DH scheme involves construction works around the city, many of which would require planning approval. Is it better to apply for that comprehensively, for the scheme as a whole, or to apply piece by piece? If comprehensively, can approval be given in such broad terms that there is flexibility for modification in the light of progressive engineering and commercial experience during progressive implementation? On the other hand, if piecemeal, what is the risk of some essential element being refused approval at an intermediate stage and of the whole commercial viability being endangered in consequence?

What are the chances of the Secretary of State 'calling in' the application for a public inquiry? How long is that likely to last, and how much would it cost?

Granted that some new legislation is needed for a CHP/DH scheme (on rates, perhaps on wayleaves, etc.) should the whole procedure be built into a special Bill in Parliament?

During this period, three factors discourage the private investor: the extra cost, the potential delay, and the risk that the approval may eventually not be given. The last is also the least quantifiable. Would private sector

*Connaught Rooms, London, 15 April

†Immediate past president, at that date president, the Institute of Energy. Director, Corporate Engineering, NEI

**Northern Engineering Industries

investors decline to accept it? How do we then fund the intermediate period?

I now turn from these questions of administrative framework to economics. In working that out, we have the usual problems of prediction. On the revenue side there are two big uncertainties.

The price at which heat can competitively be sold so that consumers will go for it, at the required market penetration, in preference to others. Compulsion has no place in these matters, other than the compulsion arising from the nature of the market: for instance, if you are in council accommodation, you must accept the council's view of the heating method; if you elect to live in a block of flats, you are committed to the heating system of that block; when you buy a central heating boiler you are committed to a particular fuel for the life of that boiler. There is no totally free choice to consumers of energy. To achieve the planned penetration, the price set for heat from a CHP/DH system takes account of other competitive prices. And customer reaction in future is a major uncertainty.

The second is the pattern of future fuel costs in real terms. It is a notoriously difficult prediction, and it enters the equation twice. It is part of the revenue expenditure on fuel; and it influences the price level of the competitive heat.

All that must be taken account of in the scheme risk analysis.

CHP is peculiar in its economics in another way, because it needs a progressive build up, to allow time to put in the heat distribution pipes and wet central heating.

It will operate in the DH mode only at first. Then it converts to the CHP/DH mode, to give the good fuel utilisation peculiar characteristic of that.

The economics are unusual. On the one hand it is a large project, implemented over many years, so Interest Bearing Construction (IDC) is significant. On the other, it is a progressive one: individual DH phases would not normally be separately viable. But once they are operating, after the first year or two, income from DH sales exceeds the cost of fuel and maintenance, and there is a revenue contribution to IDC, ie, a partial servicing of the capital borrowed so far. Cash requirements year by year are reduced.

My third broad group of peculiarities is public relations: we seem to have some problems about this. As I said at the beginning, CHP/DH is widely used in other European countries, apparently with great success. Many people feel that by not using it here we are being wasteful. There has been a tendency in the last 10 or 15 years especially, and you are well aware of it, for members of the general public to promote particular energy concepts, some good, some more mixed and sometimes the promoters have as an objective a reduced dependence on nuclear power, allied perhaps with a reduced dependence on large central utilities. And when they see that their special cause is not gaining ground — it might be fluidised beds, it might be wave power, it might indeed be CHP — they are ready to believe that sinister forces are at work. In my observation, we have a problem of that sort with CHP. The enthusiasts by and large have a pretty simplified view of its thermodynamics. They read that the efficiency of electrical generation is 35% or so, and that the remainder is rejected, they see fumes rising from the cooling towers, they put one equal to the other, and they want to know how it is that all this heat is not being employed just as it can be in continental countries. They have to find an explanation for its non-acceptance. It is easy to believe that someone is being deliberately unhelpful.

Actually, as usual, it is the technical argument that is faulty. It is true that CHP generation gives better

efficiency than conventional, but there are two counteracting factors.

The first is that heat produced by CHP (whether we are talking of hot water for district heating or steam for industrial process) has now to compete commercially with existing methods of supply, often with gas-fired central heating, and we have to recognise that existing methods of heat supply which do not involve CHP are *very* fuel effective: 80% efficient, and moving now to 90% with the condensing gas boilers being brought in for domestic use. So while producing *electricity* would be much more efficient under CHP, we have an existing and very efficient method of producing *heat* which CHP must compete with.

The second counteracting factor is that CHP is capital intensive: the turbine generators are more complicated and there are extra piping systems for distribution. So it is a classic higher first cost and lower fuel alternative energy system where the answer comes out of an economic calculation — which has to balance these compensating effects.

Finally I should like to talk about peculiarities in the financial assessments.

We are advised that we should calculate the rate of return, as a constant figure over the life and in real terms.

Actually we know that having borrowed money for a project, in the first year or two the interest is much higher than average, but as inflation proceeds over the full life the money value of the original capital becomes quite a small burden in real terms.

We have to be careful because professional economists disapprove of this argument. They say, if I may put it in my own words, that spending money makes a demand on the resources of the nation, and that can only be measured in real terms. This is no time and no place to disagree with economists, but here are two simple observations.

First that anyone who has borrowed money at a fixed rate knows that inflation eases the pain.

And second, that a regular discount, writing off investment exponentially, can give a much shorter life than the physical life of the equipment. Simple people find it hard to accept that a tidal barrage, an electrical or gas transmission grid, a power station, or for that matter a network of pipes in the ground, with a physical life remaining of anything from 20 to 100 years, has no value.

At the present time, we have an additional confusion, in that those energy processes that are not yet established in this country, like combined heat and power, have to be shown to be viable in the private sector, while traditional energy systems like electricity and gas need be viable only in the public sector.

For a start the real rates of return to be achieved are very different: 5% for the public sector and perhaps 12 to 15% for the private. The very character of the questions is also different, especially with current economic orthodoxies.

Private sector resources are not limited: cash will be found if the return is right.

In contrast, the public sector has a direct resource limitation called the Public Sector Borrowing Requirement, and what matters is competition with other projects that may claim a priority within the PSBR.

Apply that to CHP, where the hot water has to be sold in the market therefore to compete with other forms of heating, such as electricity and gas, whose capital requirements are funded according to public criteria. It will say a good deal for the inherent attractiveness of such a system if it can still compete while having to raise its capital under these adverse conditions. Moreover, a scheme will usually require complementary work by the

publicly owned utility, and might be ruled out purely for breach of PSBR, even though its economics are otherwise good: that has actually happened.

So all that adds up to is that the only straight forward thing about CHP/DH is its engineering. We have a difficult administrative framework including some harsh provisions on rates. We have a complex commercial set up — involving the ESI and private industrial companies working together — not to mention the local authorities. We have some unusual economics and financial rules — some inherent, some self-inflicted and some just eccentric. We suffer also from enthusiasts, who are liable to be technically inept, sometimes to overstate the case and to talk as though one solution was the sufficient and only answer to the nation's troubles: adopt our advice, they say, and the problem is gone. It has not. The fuel saving from CHP would have some effect on overall energy consumption of the country. But the question is: how much? CHP is one method among several for improving

energy efficiency right round the national economy, not a single and overwhelming solution that makes all other virtually uninteresting. Then there is the suggestion that people who are doubtful about CHP are wicked, either as individuals protecting their careers; or more often, institutions with a compulsive sense of self preservation.

Those of us who advocate CHP/DH for what we believe are the right reasons have to steer a subtle path through these difficulties. We get invited to put the strong red-blooded case that I have just outlined. We do not believe it and yet there are problems of a policy nature which must be publicly argued. I have mentioned two: the question of rates and the question of different financial criteria. Unless those are put right the case for CHP/DH is marginal or possibly sometimes negative. But effective lobbying must avoid obvious errors.

World energy price survey*

Britain pays more for electricity despite world energy price fall

The dramatic fall in oil prices has had a significant effect on world electricity prices. For the first time in seven of the twelve countries surveyed have recorded price reductions or price stability (Fig 1)

British business however, suffered an increase of nearly 4% in electricity costs in 1985/86, despite the anticipated benefits of the recent dramatic fall in oil prices. National Utility Services' latest annual survey of world electricity prices shows that Britain is one of only five countries among the twelve investigated to pay more for electricity this year.

Conducted annually on 1 April, the survey uses data drawn from prices actually paid at over 750 000 business locations worldwide where their consultants monitor and advise on electricity and water rates (Fig 2).

UK businesses await price reduction

The cost of generating fuels in the UK fell in 1985/86. Business consumers will almost certainly benefit from a reduction in electricity costs later in 1986 after the Central Electricity Generating Board's negotiations with the National Coal Board for a comprehensive cut in the price of coal has been agreed.

'The fall in oil prices together with cheap coal imports have put the NCB, traditionally the largest fuel supplier to the electricity generating industry, under intense pressure to reduce its prices for coal' says NUS spokesman, Andrew Johns.

Heavy industrial users have already reported credits on April electricity invoices as a result of the fuel adjustment clause. However, other users who are billed quarterly are receiving no immediate benefit. The extent to which they will do so depends on the outcome, and probable compromise deal, between the CEGB and NCB.

NUS foresee a growing trend towards self generation of electricity by consumers trying to take advantage of their own oil generating plants while the price is low.

Republic of Ireland top of the league

Eire was the most expensive country surveyed, despite a

*The survey was prepared by the National Utility Services and was released in May of this year.

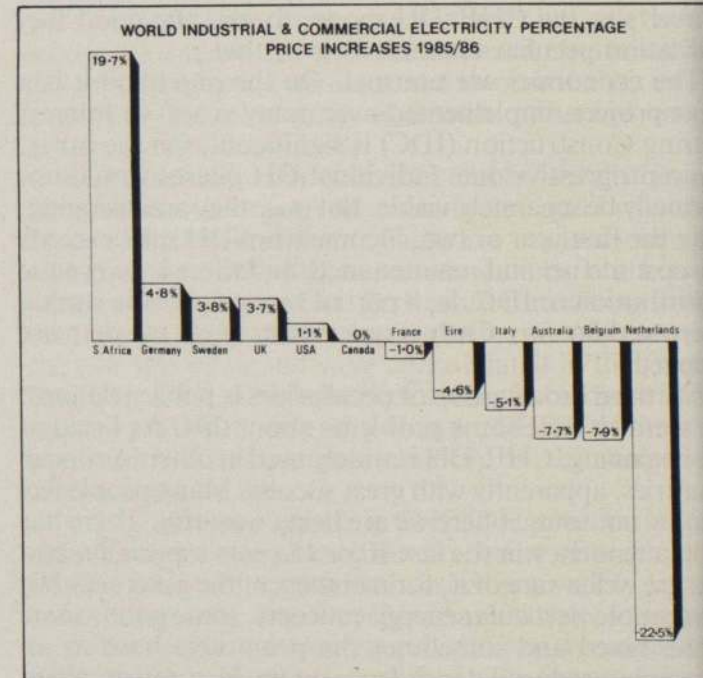


Fig 1

4.6% reduction in electricity costs. The reduction is central plank in the Irish Government's overall policy of reducing energy costs to boost industrial growth.

Germany pays more to counter acid rain

Germany moved up the international table of electricity costs with a near 5% increase, significantly more than the German rate of inflation. This is largely because the supply industry has been obliged to invest heavily in a programme to screen emissions from traditional fossil plants to reduce the level of acid rain.

United States moves down world price table

The US is largely dependent on oil and gas fired generation

ants and has, therefore, benefitted more than most from the oil price collapse.

Sweden's electricity prices stay low

Most of Swedish electricity is generated by hydro-power imported from neighbouring Norwegian hydro plants. The falling oil price has had minimal effect on Swedish electricity prices, although the below-inflation increase keeps Sweden the second cheapest country.

Swedish Government policy is aiming to gradually reduce and eventually to eliminate Sweden's small nuclear generating capacity; and 8% tax is levied to fund development projects into alternative methods of generation.

South Africa still cheapest

South Africa remains the cheapest of the twelve countries surveyed. Nevertheless the deep economic recession and high inflation in 1985/86 has prompted suppliers to increase electricity prices by a huge 20%. In the last two years South African businesses have suffered a nearly 50% rise in electricity costs.

Italian prices fall and will fall further

Italian suppliers have been quick to pass on the benefits of the fall in oil prices to business consumers. The majority of Italian electricity is generated by oil burning power stations. NUS predict a further decrease of 8% in the near future on top of the recent 5% reduction.

Belgian prices down by 8%

Despite the introduction of two new nuclear power stations in 1985, Belgium is still heavily dependent on oil and gas for electricity generation. The oil price fall prompted an 8% reduction in electricity prices.

France's nuclear policy keeps prices stable

Electricity costs in France are largely independent of fluctuations in the world oil market because of the heavy investment in a national nuclear energy programme. Although NUS recorded a 1% fall in electricity prices,

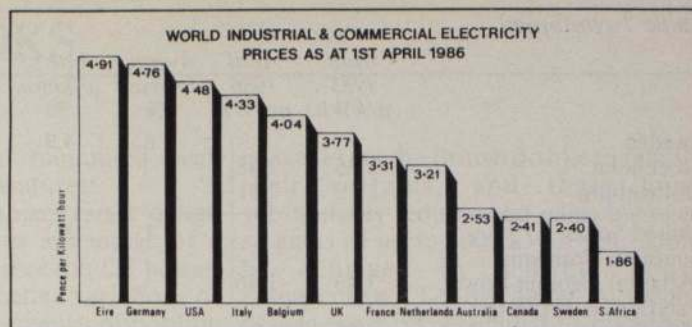


Fig 2 A more detailed analysis appears below

they are expected to rise later in 1986, now that the French elections are over.

Netherlands prices fall steeply

The sharpest 1985/86 fall in prices was recorded in the Netherlands. '65% of the Netherlands electricity is generated by natural gas', says Andrew Johns. 'With the oil price collapse, suppliers were able to offer an average 22% reduction in electricity prices'.

Canada not affected by oil price

Canada generates 60% of its electricity by hydro-power, whilst only 8% is oil-fuelled. Although price rises have been noted in some provinces, the average electricity cost has remained constant in 1985/86, a reflection of the individual supply boards requirement to repay long-term debts used to fund capital expenditure projects.

Australia continues tariff re-structuring

Australia posted an 8% reduction in electricity costs in 1985/86 and increases are not expected this year beyond the RPI increase. On smaller supply contracts, however, some boards have levied increases in line with or less than the Australian rate of inflation.

Australia has been undergoing tariff re-structuring for the last few years, although it has yet to significantly reduce costs for small and medium-sized businesses.

Table 1:

International survey of commercial and industrial electricity costs 1 April 1985 - 1 April 1986

	April 1985 p/kWh	April 1986 p/kWh	Average increase %	Rate of inflation %		April 1985 p/kWh	April 1986 p/kWh	Average increase %	Rate of inflation %
			3.7	5.50					
North Eastern	3.65	3.78			Hydro Quebec	1.80	1.84		
Yorkshire	3.67	3.86			Ontario Hydro	1.98	2.10		
Midlands	3.70	3.79			Manitoba Hydro	1.36	1.40		
North Eastern	3.54	3.58			Saskatchewan Power Corp	2.21	2.37		
Southern	3.64	3.87			Transalta Utilities Corp (Alberta)	1.92	1.82		
North Wales	3.76	3.87			British Columbia Hydro	1.93	1.88		
West Midlands	3.61	3.79			France			(1.0)	3.4
North Western	3.62	3.74			Electricité de France	3.35	3.31		
North of Scotland	3.46	3.66			Germany			4.8	0.7
ire	5.15	4.91	(4.6)	5.50	BEWAG, Berlin	4.93	5.51		
Australia			(7.7)	8.20	HEW, Hamburg	4.89	4.87		
Queensland	3.22	2.90			RWE, Essen	4.08	4.41		
State Electricity Comm of Victoria (Melbourne)	2.25	2.15			EVS, Stuttgart	4.48	4.67		
Belgium (nationwide)	4.39	4.04	(7.9)	1.53	STW, Munich	4.35	4.35		
Canada				4.1	Italy			(5.1)	7.2
Newfoundland Light & Power	2.71	2.67			Enel	4.56	4.33		
Nova Scotia Power Corp	2.50	2.82			Netherlands (Breda)	4.14	3.21	(22.5)	1.2
New Brunswick Electric Power Co	2.38	2.38			South Africa			19.7	16.2
Maritime Electric Co (Prince Edward Island)	5.25	4.82			Capetown	1.77	2.15		
					Durban	1.72	2.04		
					Johannesburg	1.46	1.76		
					Pretoria	1.25	1.49		

(Table 1 continued on p 6)

Table 1 continued

	April 1985 p/kWh	April 1986 p/kWh	Average increase %	Rate of inflation %		April 1985 p/kWh	April 1986 p/kWh	Average increase %	Rate inflati %
Sweden			3.8	4.9	Detroit Edison	4.28	4.78		
Stockholm	2.35	2.48			General Public Utilities (Parsippany)				
Gothenburg	2.19	2.31			(Jersey Central Power & Light)	6.10	5.56		
United States			1.1	3.2	Florida Power & Light	4.71	4.23		
Southern Company					Houston Industries (Houston) (Houston Lighting & Power)	4.21	3.48		
(Atlanta) Georgia Power	3.46	3.46			Pennsylvania Power & Light (Allentown)	3.58	4.40		
Pacific Gas & Electric (San Francisco)	6.05	6.31			Central & Southwest (Dallas) (Public Service of Oklahoma)	3.27	3.07		
Commonwealth Edison (Chicago)	4.33	4.79			Carolina Power & Light (Raleigh)	3.69	3.81		
American Electric Power Co (Columbus) (Ohio Power)	3.23	3.21			Niagara Mohawh Power (Syracuse)	4.15	4.29		
Consolidated Edison (New York)	7.84	7.72			Long Island Lighting (Mineola)	7.35	6.76		
Southern California Edison (Rosemead)	5.59	5.80			Ohio Edison (Akron)	4.37	4.27		
Middle South Utilities (New Orleans)					Union Electric (St. Louis)	3.01	3.75		
(Louisiana Power & Light)	3.23	3.49							
Public Service Electric & Gas (Newark)	5.31	5.64							
Virginia Electric & Power Co (Richmond)	3.08	3.05							
Texas Utilities (Dallas)									
(Texas Power & Light)	3.33	3.10							
Duke Power (Charlotte)	3.16	3.47							
Consumers Power (Jackson)	4.27	4.13							
Philadelphia Electric	4.93	5.02							

Notes

- i Exchange conversions based on Wall Street Journal 1 April 1985 as published 2 April, 1986
- ii Figures based on customer size of 1000 kWh, 450 000 kWh/month and customer-owned transformers, industrial and commercial users.
- iii All prices expressed in pence sterling per kWh. The country average percentage increases are unweighted.

British Flame Research Committee*

It was agreed at the Executive Committee meeting held on the 19 September 1985 that the representative of the Institute of Energy, on the British Flame Research Committee, would report annually, in writing, to the Executive Committee.

Report

The principal activities of the British Flame Research Committee are to maintain interest in international flame research by way of laboratory and engineering trials, the benefits of which apply to many industries including iron and steel, non-ferrous metals, glassmaking, cement making, furnace builders, etc.

The work of the International Flame Research Station, IJmuiden, Holland, is funded through membership subscriptions via the several national committees, and from specific research contracts.

The research programme of the International Flame Research Foundation is conducted with the assistance of research panels, each of which has a chairman and a secretary; the panel members are appointed by the National Committees, including the British Research Committee.

The Programme Executive Committee is responsible for correlating and co-ordinating the recommendations of the panels, taking into account advice from the Research Station. They are also responsible for preparing a final plan of the year's research for consideration by the Joint Committee of the Foundation.

Members of the research panels also carry out work

in their own laboratories or research stations, appropriate reports of which are submitted at panel meetings.

The results from non-contract work carried out by the Foundation are available to the members in the form of reports. These members are regularly informed of the availability.

From time to time, National Flame Days meetings are held which are open to a wider audience. During September 1985, a two-day *British Flame Days* Conference was held at Sheffield University. The meeting was very well attended, attracting about 100 participants. The five Associated Bodies sponsoring the meeting included the Institute of Energy. The three technical sessions were entitled *Recent Developments in Combustion Research, Developments in High Efficiency Furnaces and Boilers and Furnace Emissions/Control*. All the papers presented were invited contributions. The first paper summarised some recent work carried out at the IFRF and thus made the work of the Foundation known more widely.

PROF J SWITHENBANK FEng (*President*)

*The Secretariat offices are now at The Institute of Energy, Devonshire Street, London W1N 2AU. The hon sec is Dr Roy Morgan (Group Research, Shell International; tel 01-934 3749)

Conference notice: Aluminium and energy: a 100 years partnership 19 September

The Institute of Energy is in association with University College, North Wales and others in the above conference. Venue: UCNW, Bangor. Registration: £46.00 (incl VAT). Students: £3.00. Enquiries: F J L Bindon 0248 713330 or 0248 352 732

Preparing the company energy plan

Peter Harris

Energy Publications

132pp. £27.00 hardback

The author draws upon more than 20 years experience in the energy management field in order to present this guide to energy managers. The large page size makes text, tables and other data easy to read and most important, permits the use of large-scale charts. Each item of information is presented in the most suitable manner to make it useful, convenient and readily understandable.

It covers the essential areas of the energy manager's tasks when he is required to present an energy programme to his management and it gives good guidelines into the methodology needed for a successful energy management programme.

There is a wealth of data on a variety of topics and the author's experience in these matters has been drawn upon to good use.

The book has been presented quite correctly as a planning guide and not as a text book on energy subjects. In this format it will undoubtedly appeal to the senior management of companies who already have energy management programmes and it will add substantially to their knowledge and awareness of what is required of and what goes into an energy programme.

Gordon Webb

The Pennyland project

Dr R Lowe, Prof J Chapman and R Everett

Energy Research Group, Open University
£10.00

This ETSU report comprises unnumbered A4 pages closely covered with typescript, graphs and diagrams. It is 25 mm thick including paperback covers, thus indubitably it is a comprehensive report on an enterprising, almost exciting, housing venture.

The Pennyland Project at Milton Keynes incorporates house design, layout, construction and monitoring of an estate of 177 low energy houses. The project started in 1976 when there was relatively little knowledge about the performance of well-insulated houses of a passive solar design in the UK.

Design studies considered house orientation and shading, the effect of various fenestration options, solar gain, insulation quality in construction and applied materials, etc. To cruelly summarise the design study findings: a south-facing aspect is best for principal rooms with quite small windows on northern and eastern aspects, but there is no benefit from increasing beyond a 40% window area on south facing walls. Design studies also suggested that a

southerly orientation minimised peak summer house temperatures.

The Pennyland Project estate design enjoyed the enormous advantage of a green field site, therefore the 177 houses were laid out in attractive variations of plot shapes and sizes, irregular disposition of house groups and service streets, all to make the most of sunshine — or indeed to enjoy the considerable solar gain available whenever the sky is bright. Some landscape mounds were constructed to reduce wind chill and to enhance privacy — sophisticated and sensible refinements that the commercial estate developer would probably not think, and most certainly would not want, to do.

Another non-commercial decision was to build half the houses to Scandinavian insulation standards (much better than our then prevailing 1982 UK Building Regulations). All houses enjoyed the heat bank effect of dense poured concrete inner partition wall and floor slab. The inner skin of outer walls was in lightweight concrete as dense material would seriously reduce U Values. Glass fibre bats and an outer skin of traditional brickwork completed the outer shell.

To make realistic energy usage comparisons, an earlier estate built to 1976 Building Regulation Insulation Standards was used as a control group. Monitoring equipment included simple fuel consumptions, some separate metering of cooking, heating and water heating consumption was also applied. Complex house instrumentation was avoided, and indeed the low-tech equipment and household records proved adequate. Weather data, including hourly checks on wind speed and direction, solar radiation, etc were recorded at a separate local weather station.

Occupant behaviour and family size obviously affect energy consumption, but a simple fact revealed and worth considering is that gas heating and hot water in the low energy properties costs less than electricity used. These houses provided minimal complaints of cold discomfort during the very severe 1981/82 winter weather (down to -17°C air temperature), and comfort was maintained from an 8.2 kW output gas boiler.

Comfort was however achieved at the cost of some condensation and mould growth, thus the need for trickle ventilation generally, and occasional positive ventilation from bathrooms and kitchens was identified.

Energy balances were made which incidentally revealed that gas boiler flues can waste away more heat than is really used — hence no doubt British Gas current enthusiasm for pilot-less and condensing boilers. The balances determined the energy reductions from applying various insulations and system control improvements.

Solar energy considerations have to

concede that the British do like to feature their curtains, and these must substantially reduce solar gain, but even so gains of up to 1000 kW a year could be achieved by sensible house management. To do better it seems, people must be persuaded to take their knick-knacks off the window sills and replace the curtains with insulated shutters.

A social survey investigation is reported, this includes such matters as the friendliness of neighbours and the effect of landscape greenery. Not perhaps strictly energy related, but certainly just as relevant to the quality of living as is thermal comfort. All very interesting reading anyway.

Cost conclusions are that for an extra £450 put into better energy-saving arrangements in an ordinary domestic house, energy savings of £150/y can be effected, which may not impress industrial accountants but should certainly be a priority for householders and housing authorities.

The report includes a wealth of very lucid tabulations and graphics which illustrate the researchers findings. There is so much detailed information in this report that this review is necessarily somewhat superficial. This reviewer's only disappointment is that there is no mention of solar domestic water pre-heating which, from his own home experience, he knows to be worthwhile.

The report is certainly well worth its cover price of £10.00 to any concerned house builder, estate developer or researcher in domestic engineering.

Don Hayes

Publications received and noted

Approved code of practice on standards of training in safe gas installation.

Health and Safety Executive, available from HMSO Publications Centre, PO Box 276, London SW8 5DT. Telephone 01-622-3316

28pp. £3.75

This consultative document is available for comment. Comments should be sent to: Ms E Norman, Health and Safety Executive Hazardous Substances, Division B4, 1 Chepstow Place, Westbourne Grove, London W2 4TF. Comments should reach Ms Norman not later than 15 August 1986.

□

Flexible energy policy Call from the Institute

In a recent letter to *The Times* P C Warner, the then president of the Institute of Energy, argued the case, in response to a *Times* leader, for a flexible energy policy.

He wrote 'during the 1984 coal crisis the generating boards were able to switch to oil and nuclear because their policies had been aimed at diversity of supply (in electricity generation, the varying load demand dictates that a proportion of the inventory is unused most of the time, so diversity of plant types is economically reasonable). Scope for flexibility exists also in other fields.

'The central problem is that plant time scales are long, but fuel prices may change quickly. When deciding on a new energy investment one ought to take account of the probable fuel price over the operating life of the installation (whether it is a coal mine or a domestic heating device): difficult enough for the specialist, but quite impossible for the man on the omnibus. It is this incompatibility of time scale that rules out conventional *market preference* in energy matters: we are not choosing wallpaper, there is an objective reality to be judged.

'The one thing that we can predict with confidence is that fuel prices will be erratic, so we should choose policies where they matter least, ie, other things being equal, broadly a preference for options with high capital cost, high energy conservation, low fuel, consumption and fuel diversity.'

Source: *The Times*

North Sea Pipeline go ahead

In April the Government gave the go-ahead to a £47M plan by Shell and Esso to construct a pipeline between the Auk and Fulmar North Sea oilfields, reported the *Financial Times*.

The project will involve upgrading the 11-year-old Auk platform and will enable Auk oil to be exported via Fulmar, instead of loading by tanker.

This will enable Auk to produce oil for about 270 days a year, 50 days more than at present thus reducing Auk's running costs.

The project will ensure production of an extra 2.5M barrels of oil from Auk, before the field, the third oldest in the UK North Sea, is depleted in the mid 1990s.
Source: *Financial Times*

IEA No energy policy change

Energy experts from the 22 member-countries of the International Energy Agency decided that there was no need to

change existing IEA energy policies despite the collapse of oil prices on international markets, reported the *Financial Times* earlier this year.

Mrs Helga Steeg, IEA executive director, said after the agency's governing board met in Paris yesterday that member countries agreed that 'no new action in energy policy' was required at the present time although the IEA would watch future developments with vigilance.

The IEA estimated that crude oil transactions were now taking place in 'substantial volume' in a price range of \$15-\$16 a barrel under netback or other special price arrangements and that the spot markets reflected only 'very thin' physical trading.

IEA officials said spot market trading prices and trading were much lower than six months ago, with spot quotations for the most frequently-quoted crudes ranging between \$11.5-\$14 a barrel.

Mrs Steeg said there had been no discussion on the issue of the IEA's minimum oil safeguard price of \$7 a barrel.

The IEA said that energy policy could best be achieved 'through flexible, open and resilient markets'.

It also reaffirmed its existing energy policy aims including energy conservation and efficient use of energy, energy security, diversification of supplies, and their reduction of energy trade barriers.

It also stressed the need to maintain adequate stock levels, urging member-countries to take advantage of the current oil market situation to increase their level of stocks.

In the longer term, lower oil prices had not lifted concern about energy supply security. On the contrary, they might bring forward the period when tighter energy markets could be expected, the IEA said.

Source: *Financial Times*

Ireland Pressure from IEA

The International Energy Agency (IEA) has urged Ireland to adopt a comprehensive energy conservation policy particularly in the industrial sector at the same time as continuing its efforts to boost oil and gas exploration, reported the *Financial Times*.

The IEA says, in a report published in April, that conservation remains the weak point in Irish energy policy. It notes that while Ireland has succeeded in reducing its dependence on imported oil in recent years by developing natural gas use and increasing coal imports, net oil imports are in the longer term expected to increase again.

Net oil imports are currently forecast to rise from 4.23 Mt of oil equivalent (Mtoe) in 1984 to 5.7 Mtoe a year by the end of the century. Coal imports are also expected to rise significantly from 1 Mtoe

in 1984 to 2.74 Mtoe in the year 2000. During the same period, indigenous production of solid fuels, mainly peat and natural gas are both expected to fall at an annual rate of 0.9% and 1.8% respectively.

Source: *Financial Times*

Success....in fluid engineering

BHRA, the fluid engineering centre exceeded its first year target of 14 members for its Multi-phase Pipeline and Equipment Service announced in April 1985. 17 major international companies, including producers, contractors and equipment manufacturers, have joined MPE and strong interest has been expressed by a further seven organisations.

MPE operates as a generic research design and development partnership between BHRA, oil and gas operators, contractors and equipment manufacturers, and aims to improve the profitability, efficiency and safety of multi-phase pipelines and equipment. BHRA's technical expertise is centred on its understanding of internal flow systems, transients analysis, and the control of heat and mass transfer. The combination of this high-quality fundamental and applied engineering research with the industrial experience and operating practice of the MPE members ensures the relevance and usefulness of the work programme results. Subjects nominated by the founder members include: large pipeline studies, and improving separation processes.

In addition, members of MPE can commission research projects or trouble-shooting investigations to solve their particular fluid engineering problems. For example, single sponsor projects undertaken by MPE to upgrade separator design and efficiency have already reduced capital costs by 15%, improved product quality by 25% and increased product throughput by 100%. Based on this type of experience, the potential benefits to the industry of multi-sponsor work can offer such marked improvements that oil recovery from deep water and smaller fields becomes viable. At the same time, possible pollution problems would be reduced, while product costs could be maintained or reduced.

Source: *BHRA*

Geothermal energy... ...in the Azores

Diana Smith recently reported on the energy scene in the Azores in the *Financial Times*.

'Wherever you stand on the island of Sao Miguel you are reminded of the

volcanic origins of the Azores. The grey-lack stone that decorates whitewashed churches and houses is basalt, a volcanic rock.

The shimmering pale-blue or pale-green lakes that dot the highlands lie in the craters of extinct volcanoes.

Hot mineral springs and rancid, sulphuric geysers gush from the bowels of the earth, offering relief to the rheumatic and arthritic, but little pleasure for the palate or nostrils.

In the heights of Serra de Agua de Pau, at the centre of the island, a project is underway to harness the geothermal force lying beneath the surface to produce 25% of Sao Miguel's electricity within four or five years.

The plan is daring — and expensive. It requires a \$30M investment, a weighty sum for a region whose total 1986 budget is £30bn (\$180M).

If negotiations, now in their final stages, are successful, the project will be undertaken by a joint venture of General Electric of the US, with financial backing from General Electric of Portugal and a consortium of Portuguese banks and insurance companies, and Stone and Webster, the major US civil engineering corporation.

Rather like oil-company contracts, the operators will drill several wells if necessary, until they find geothermal steam under sufficiently-high pressure to generate 10MW of electricity when the entire project is operating. Electricity generated will be sold to EDA (Electricidade dos Azores) the archipelago's electricity corporation.

The Serra de Agua de Pau looms over Ribeira Grande, which the regional government is promoting as a new industrial estate. Ground has already been levelled, and roads laid on the estate, and soon a model pavilion will be built.

With pre-cleaning to remove corrosive elements from the steam and hot water that runs at a constant temperature of 8°C the authorities hope it will be possible to pipe steam and naturally-hot water to factories on the estate.

All being well, with an energy source that is in principle, inexhaustible, the authorities hope the project will be in full operation within three years. If it goes well, it will be a spur to similar projects on the island of Terceira, for which surveys and studies have already been completed with encouraging results, and later, on the island of Faial, well to the west.

The possibility is also being explored of building hydro-electric schemes on Sao Miguel, the most heavily-populated and well-watered island of the archipelago, and actively fostering use of alternative energy by industry, to decrease dependence on imported oil derivatives.

Major dairies, like Lacto Acoriano, now use wood — a raw material in plentiful supply on Sao Miguel — not fuel oil to generate steam. Houses, hotels and restaurants boast wood-burning stoves to offset the moderate but damp climate that prevails in winter.

Since autonomy, the authorities have laboured hard to take electricity to hamlets that not long ago lived by the

light of oil lamps. It is not an easy task, cottages and hamlets lie far from each other over difficult terrain. But slowly the archipelago is moving into the electrified twentieth century, and growing numbers of electricity poles can be seen clambering up sheer cliffs and down slopes, across fields and into tiny, close-knit communities.'

Source: *Financial Times*

Energy efficiency Beta awards

In line with their PEP awards for industry and the Medallion Homes scheme for the domestic sector the Electricity Council have announced the Beta awards for the commercial sector.

The awards will be presented annually in two categories for the greatest reduction in total energy costs, or the most cost-effective improvement to a building's amenities and environment. The improvements must have been achieved by the use of modern electrical techniques.

The awards apply specifically to the commercial and public sector, industrial office buildings may be entered but not industrial premises. The two categories will be for buildings with above and below 1000 m² of floor space. There will be cash prizes of £1000 each for the national winners and £500 for the regional winners, there will be 14 of these in total.

Each region will have a panel of judges made up of architects, energy specialists, Energy Efficiency Office representatives and building specialists. Among the judges will be Dr Elliot Finer (EEO), IM Kenny (president, CIBSE) and Dr Vic Hanby (Member, Institute of Energy).

Application forms can be obtained from sales staff at local electricity boards or the Electricity Council. Forms must be returned no later than 30 June 1986. Regional awards will be presented in September and the national awards will be presented in November.

Source: *The Electricity Council*

North Wales Survey for power station

Sophisticated seismic techniques to investigate structural geology are being applied in a £95 000 site investigation contract placed by the Central Electricity Generating Board.*

The geophysical survey will help determine the preferred layout for a possible nuclear power station at Trawsfynydd near Ffestiniog in North Wales. A new station would replace an existing installation which is expected to cease operation towards the end of the century.

A feature of the two-month long project is the use of both P (compressional) and S (shear) wave seismic refraction techniques. The latter is of particular interest as S-waves are related to the dynamic elastic modulus of

rock. The behaviour of the sediment rock mass during seismic events or when affected by external vibrations (created by heavy machinery for instance) can then be predicted using the results of the S-wave refraction data.

Using a 'state of the art' gradiometer, a magnetic survey is also being undertaken by the field crew of 15 men who are working in five teams, two land survey teams and three geophysical survey teams.

Source: *Press release*

Nuclear reprocessing Contracts worth £1600 M signed

Contracts worth £1600 M for the reprocessing of used fuel from Britain's advanced gas-cooled reactor stations have been signed by the Central Electricity Generating Board, the South of Scotland Electricity Board and British Nuclear Fuels, reports *BNF Bulletin*.

The agreements allow for 10 years worth of reprocessing of AGR fuel at the Thermal Oxide Reprocessing Plant being built at Sellafield in Cumbria. 1320 t of fuel will come from the CEGB's reactors and a 530 t from those of the SSEB. Letters of intent have been sent to BNFL by the two Boards pledging use of the plant for the second 10 years of its operating 'life'.

The Boards see reprocessing as preferable to disposal because it means getting back unburnt uranium and fresh plutonium which can be used anew in reactors to make more electricity — and the nuclear material now inside Britain's reactors and stored by BNFL adds up to this country's biggest potential home-based source of energy, dwarfing that of the North Sea and exceeding that of the economically recoverable coal reserves of the UK.

Also, the Boards say that 'there must be a big question mark' over the public acceptability of disposing of used nuclear fuel intact, in other words treating the unburnt uranium and the plutonium as waste.

This would be waste with 100 times as much plutonium in it, for example, as there is in reprocessing wastes; and if there are difficulties today in persuading the public to dispose of low-level waste, the task of persuading them to accept the disposal of whole fuel elements would certainly be much more arduous.

Source: *BNF Bulletin*

Dry fuel store planned

The CEGB and the SSEB have said that they are interested in building a dry store for used advanced gas-cooled reactor fuel. The store would act as a 'buffer' between AGR stations and the Thermal Oxide Reprocessing Plant at Sellafield in case reprocessing were interrupted for any reason.

'It is unreasonable', said the CEGB's

*Osiris Seaway of Deeside

chairman Lord Marshall, 'to suppose that THORP, or a successor, will run smoothly and without interruption for almost half a century. If it needs to close down for refurbishment, or repair, it might pose problems for AGR fuel.'

What is more, when THORP reaches the end of its 'useful life', the AGR stations will almost certainly *not* have reached the end of theirs. On present plans, BNFL would have to build another reprocessing plant in plenty of time to allow a smooth crossover from THORP. But if a dry store is available, a new option opens up: that of putting used AGR fuel in it while BNFL refurbishes THORP, rather than build a new reprocessing plant.

The dry store would not be a substitute for reprocessing but a complement to it, the generating boards stress. It would cost about £200 M, and take four years to build.

Source: *BNF Bulletin*

NCB

Best results for years

The National Coal Board had an estimated loss of £50 M in 1985/6 on a turnover of £5 billion. In the last quarter of the year the industry was in profit. This is the best financial performance for seven years, and compares with a loss of £875 M in 1983/4, the last year before the NUM's strike action.

The result is £300 M better than the Board forecast at the beginning of the financial year. The industry was expected to need £929 M for its cash flow from the Exchequer in 1985/6. In fact only £430 M was needed. Investment expenditure amounted to nearly £660 M.

This financial progress may not be repeated in 1986/7 because of the impact of the fall in prices for oil on the prices the industry can obtain for its coal.

Source: *NCB*

Underground gasification NCB trials

A £15 M underground coal gasification experiment which could unlock the energy in millions of tonnes of coal in otherwise inaccessible undersea reserves, has been proposed by the National Coal Board with the financial backing of the European Economic Community, reported *Gas World* in May.

The experiment, subject to planning permission and the drilling of a proving borehole to confirm the suitability of the site, will be made on a geographically isolated coal seam about 2000ft beneath a wartime airfield near Newark, Notts. The seam is 6ft thick and on the edge of the Nottinghamshire coalfield, but could not be worked by conventional mining. It is also remote from existing coal workings, as well as from proposed coalfield development.

According to the NCB, oil industry techniques will be used to drill a deviated borehole from the surface. It will be

vertical at the start and then be curved through 90° to enter the coal seam horizontally and remain in the seam for at least 1000ft. Three vertical boreholes will be drilled from the surface to connect to the in-seam hole.

Surface plant will supply steam and oxygen down one of the vertical boreholes to stimulate the production of gas which will be extracted from one or both the other vertical boreholes. The gas produced will be cleaned and burned on site unless a local use can be found for it.

It is expected that between 30 000 tons and 60 000 tons of coal, will be gasified during the six year trial period.

News of the experiment prompted a note of caution from Prof Sir Frederick Warner who was involved with coal gasification experiments in the 1950s. In a letter to the *Financial Times* he wrote: 'I hope before any work begins that a desk study looks at the results of the P5 trial at Newman Spinney in 1958/9 which gasified 10 000 tons and operated a 5MW power station. The gas was dirty and around 6% of the calorific value of natural gas'.

He went on to say 'I do not think the trial would have begun if the small-scale experiments beforehand had been properly assessed. They set up an underground gasification executive which included Bronowski and Schumacher. In 1957 a team, of which I am a survivor, was despatched to see work in the USSR. This was inspired by Lenin's observation in Iskra (1915) about Sir William Ramsay's experiments in 1912. We saw directional drilling at Lusichansk and examined work on hard coal there and on lignite at Tula. Even using oxygen-enriched air, the gas was never better than 10% of natural gas.'

'From memory without looking at the files, the process involves blowing so hard to keep the coal alight that the gas emerges with little hydrogen or carbon monoxide but a lot of hot flue gas. The heat recovered from the coal did not exceed 50% because of conduction to the surrounding strata and water seeping in'.

The NCB told *Gas World*, however, that they anticipated the recovery of gas with more than 30% the calorific value of natural gas, based on the findings from trials held recently in the United States which produce gas at 335 Btu/ft³.

'A lot of work has been done since the days of Newman Spinney when what was being attempted was like trying to fly to the Moon in a Spitfire. There is also the fact that the Newman Spinney trial involved a shallow, narrow coal seam fed with low pressure air: the NCB experiment involves a deep and thick seam being fed with high pressure steam and oxygen. Overall, we expect better results than those from surface gasification of coal.'

According to Ken Moses, the Board's technical director, it was important that Britain should have a leading role in this type of research to ensure a continuing supply of fossil fuel.

'There is no guarantee of success in the limited field trial we are proposing but if we are ever going to be able to extract

energy from coal reserves which cannot be mined conventionally we need to carry out this kind of research.

'We know from oil exploration results that there are billions of tons of coal seams up to 70ft thick way out under the sea. This could be the only way for future generations to get at the coal.'

Source: *Gas World*

Czechoslovakia Reducing pollution

Czechoslovakia has responded positively to an appeal for a 30% reduction in sulphur dioxide emissions from 1980 to 1993.

The country's experts see the way to this goal in the expansion of nuclear power production and in international cooperation in the development and use of desulphurisation equipment.

In 1995, Czechoslovak nuclear power stations are to generate 41 000 MWh of electric power which will substitute energy supplies from power stations burning coal with high sulphur content, a measure which will cut sulphur dioxide emissions by 1 Mt. To fully meet the commitment another 200 000 t of sulphur dioxide will have to be trapped by desulphurisation systems using limestone.

Soviet experts have recommended a desulphurisation method which uses magnesite. This method will be applied at a 200 MW unit of the Tusimice Power Station in North Bohemia.

Source: *Czechoslovak News*

India DIPC system developed

Direct ignition of pulverised coal (DIPC) system, developed in India* almost completely obviates the consumption of costly fuel oil for boiler warm-up, ignition of coal, and coalflame stabilisation at low loads. Moreover, this system will provide additional coal-firing capacity to offset the shortfall in the milling and coal-firing capacity existing in many power stations due to the available coal being of poorer quality than what the steam generators were originally designed for. In view of these impressive benefits accruing out of the DIPC system, Madhya Pradesh Electricity Board has placed a letter of intent on BHEL for the supply, erection and commissioning of two such systems for the Satpura Units VI and VII.

The potential of DIPC system in effecting oil conservation is being realised in the country. The system can be easily retrofitted in any existing pulverised-coal fired steam generator. BHEL is geared to offer commercial DIPC Systems for 60 MW, 110 MW and 210 MW steam generators.

Source: *BHEL Engineering Newsletter*

(Political and Economic continued on p 11)

*Developed by Bharat Heavy Electricals, New Delhi

INDUSTRY YEAR 1986

Company message to schools

Companies are spreading the Industry Year message to schools — through a computerised business simulation game, NISIM, reported *CBI News*.

Aimed at 16 to 18 year olds, the exercise gives players a feel of what it is like to run a business — analysing information and figures, making decisions on marketing, personnel and finance.

Study and visit facilities around the port Sunlight and Bromborough factories for teachers and pupils have been extended, as Unilever step up activities to increase understanding of the role of industry.

The company's Arts and Industry project involves three commissioned artists, who have been visited by school parties. The resulting works, by the

professional artists and by the pupils, will be displayed at the Williamson Art Gallery, Birkenhead.

There will also be an *Industry and the Home* exhibition at the Merseyside Museum.

Nationally, Unilever has made a video for Industry Year, illustrating its support for enterprise agencies and Youth Training, judged by the company to be a particularly appropriate form of community involvement for today's needs.

The video, *A Working Partnership: Industry and the Community* features six Merseyside schemes, representative of Unilever supported schemes throughout the UK, and is intended for employees, educationalists, politicians, local government and other companies.*

Source: *CBI News*

New centre for Scotland

A major financial grant to establish a new engineering and research facility at Heriot-Watt University in Edinburgh is being provided by a leading North Sea oil company.

The company is giving the University some £320 000 to finance the Conoco Centre for Petroleum Engineering Studies on the University's Riccarton Campus.

The grant marks the successful completion of the world's first tension leg platform which is now producing oil in the North Sea Hutton field.

The new building will have 10 000 ft² of space for teaching and research and will later be linked by a covered walkway to the University's existing department of petroleum engineering.

The university receives about 350 applications every year from the UK and many other countries for the 32 places available on its postgraduate Master of Engineering degree course in petroleum engineering. A further 25 graduates in the department are engaged full-time in advanced research, much of it highly relevant to North Sea operations.

Heriot-Watt is one of 24 British universities supported by Conoco's Aid to Education programme. Previous support for Heriot-Watt has included the funding of a Conoco laboratory.

The grant will provide more than half the total funds for the new centre, the remainder coming from the University and from the University Grants Committee.

Source: *Press release*

*The video is available for £5 from Unilever External Affairs Dept., PO Box 68, Blackfriars London EC4P 4BQ, in VHS Beta and U-matic formats.

cond seminar with Parliamentarians

the Institute of Energy in association with the Parliamentary Group for Energy Studies and the Institution of Mechanical Engineers

Energy policies and market forces

4 March 1987

Institution of Mechanical Engineers
Adge Walk, Westminster

general, advocates or rival energy policies argue that theirs are cost effective and consistent with sound economic principles, and are the ones least vulnerable to unplanned external events. Even though they may agree about the policies, there is a broad acceptance that those are the criteria that matter in judging between them. Nevertheless, their application produces widely differing opinions.

The object of the seminar is to bring together legislators and energy professionals to examine the way we measure cost effectiveness: whether we should leave it to market forces, what that means and what it implies; what are the interests of the consumer (industrial, commercial or domestic) and how does he decide about energy investment; how public bodies do so; the economic justification of Government R&D on energy, and how the topics should be selected; the mechanisms available to a government to give effect to energy policy including conservation; the timetables of implementation and their economic significance.

Wind... in the willows?

Although pure soap is white, and it is opaque, in the early years of this century a bold advertiser successfully sold a soap which was amber-coloured and transparent, under the slogan 'It's so pure that you can see through it'. The public who could see through the soap evidently couldn't see through the advertising.

The principle that, if you only have sufficient nerve, you can actually make capital out of the weaknesses of your product has evidently survived to this day. This can be seen in the methods used by some to advocate wind power. For, if there is one thing that is undeniable about this particular energy source, it is that it

will offer an affront to the environment which is far more serious than any energy source it will displace.

So why not capitalise on this weakness? Why not call an array of perhaps 2000 towers, each requiring 1 km² of countryside for every megawatt, a wind forest? This will conjure up visions of bluebells in spring and of shy forest creatures. First class!

But is it not possible to do better than this and describe the whole operation as *harvesting the wind*? In this way the public will associate wind power with country folk drinking cider in cornfields. And to cap it all why not describe it as a

soft energy option? Brilliant! In the ways wind power will appear to be not an industry, but a branch of agriculture.

But energy technologists ought not to allow themselves to be diverted from applying to wind power the same relentless analysis of its technical, economic and environmental aspects that they would apply to other sources of energy. And they should combat the activities of hidden persuaders who seek to pour soothing words over hard realities.

V C MARSHALL PhD
(Fellow)
Shipley

The economics of energy

Oh dear! I do seem to have touched two of your correspondents on sore spots (*Energy World*, April 86) with my letter in the February issue. Instead of dealing with what I have to say they make personal attacks. Owen Dumpleton, misquoting Oscar Wilde (he refers to him as Confucius), says I am a mean man who knows the price of everything and the value of nothing; and Norman Jenkins says that my letter was incomprehensible, that I am an inveterate opponent of CHP and that I should declare my commercial interest.

I am not opposed to CHP and I have no commercial interest. I have been retired since 1980 and apart from examining a few PhD theses, refereeing papers for learned journals and performing a few pieces of energy economics research when invited to do so my continuing interest in energy matters since then has been entirely for my personal satisfaction and unmotivated by considerations of commercial gain.

Both of your correspondents seem

under the impression that there is some sort of 11th commandment that says 'Thou shalt conserve energy above all other resources', and that anyone who thinks otherwise must either suffer from serious character defects or be motivated by personal gain or both. I should have thought the meaning of my earlier letter was perfectly clear. It was that energy is not the only resource consumed when an energy service (home heating for example) is supplied and that the only common unit linking capital, labour and fuel is money. The lowest cost solution is the one that consumes least economic resources and is the one to be adopted unless we have good reason for believing some resources are incorrectly priced. If the least cost solution turned out to be CHP I would be the last to complain; but if it should be electric ohmic heating I would feel entitled to complain if someone wanted to outlaw it on grounds that has nothing to do with the husbandry of all economic resources taken together; and, in this connection, I would certainly

not regard it as valid to disallow electric space heating simply because it is a form of thermodynamic life that converts primary fuels into electricity involves rejection of heat at low temperature.

So, when Norman Jenkins accuses me of 'popping up' to oppose him when he advocates CHP, he is mistaken. What I am objecting to are the inevitable accompanying attacks on the electric industry for wasting heat. All product processes waste something and one must just as well attack the furniture industry for producing sawdust. It is nice if we can find a use for waste products but it makes no sense to spend more money doing them than they are worth. So if we use CHP in any given situation let it be because it is the cheapest solution, not as part of some process that elevates energy saving to something approaching a religion — let it be of all a religion with its own church in the shape of an authoritarian central energy agency.

L G BROOKES PhD
(Fellow)

Post-Chernobyl: the USSR energy prospects *continued from page 1*

will account for no less than 85% of the output of electric power without any increase in organic fuel consumption. A large number of highly efficient nuclear reactors, turbine-driven sets, gas turbines, automated technological control systems, and steam-gas and magnetohydrodynamic plants are to be introduced.

A wide programme of the modernisation and reconstruction of electric power plants is to be implemented. In 1986-1990, power-generating equipment of no less than 25 M kWh will be modernised, while outdated equipment of 15 M kWh will be dismantled.

Fuel will have to be used more effectively by power plants, although 326.2 g/kWh were consumed in 1985, which is among the world's lowest. During the current five-year plan period this indicator will be further lowered.

A wider use of such renewable power sources as solar and geothermal are an important reserve for saving organic fuel. An experimental 5000 kW solar electric power plant is nearing completion in the Crimea, and a 200 000 kW Mutnovskaya geothermal electric power plant is to be built on the Kamchatka Peninsula. Geothermal heat is being used by the inhabitants of the cities of Tbilisi and Makhachkala, the city of Kizlyar, and many settlements.

In 1985 the Soviet Union's electric power plants (total capacity of 314 M kW) produced 1545 billion kWh of electric energy. The thermal power plants (TPPs) accounted for 75.3 % of that amount, the hydropower plants (HPPs) for 13.9%, and the nuclear power plants (NPPs) for 10.8%. The share of the TPPs will gradually decrease when NPPs and HPPs are built on a large scale, although the TPPs' absolute output indices will keep growing as before.

The country possesses resources necessary for long-term development of its power engineering. But the problem is that fuel production and transportation are growing more and more expensive. The bulk of organic fuel deposits are in the Asian part of the USSR, in distant and sparsely populated areas with severe climate, whereas the overwhelming majority of the consumers are in the country's European part. So the energy policy has had to be changed. The stake now is on accelerated development of nuclear power engineering, a vigorous energy-saving policy, and the substitution of liquid fuels first with gas, and subsequently with coal. Alternative renewable sources of power are to be used more widely.

Institute of Energy conferences in 1986 to 1988

The following programme of conferences are currently being organised by the Institute of Energy, and its associated overseas societies, and other UK societies 'in association' for the event.

You are invited to note for your diary pages, and to respond, where indicated to the respective calls for papers (see also loose enclosures this issue).

1986
19 November **Fuel additives**
(in conjunction with the Yorkshire branch, and in association with: Combustion Engineering Association; Institute of Hospital Engineering; Institute of Petroleum; Institution of Plant Engineers.
Venue: AHED House, Ossett, Yorkshire
Chairman: Philip Hands (Dearborn Chemicals)
Papers: Notification of intent immediately please: Phone 01-580 0008

1987
4 March **Energy policies and market forces**
(in association with the Parliamentary Group for Energy Studies; the Institution of Mechanical Engineers (and others to be confirmed)
Venue: The Institution of Mechanical Engineers
Chairman: P C Warner (NEI, Newcastle upon Tyne)
Papers: Individually invited

23/24/25 June **First European dry fine coal conference**
Venue: Harrogate, Yorkshire
Chairman: Dr J M Topper (NCB CRE)
Papers: Synopses invited by 31 July to Institute of Energy

24/25 Sept **Influence of inorganic constituents on coal**
Combustion in small to medium-sized boilers
Venue: Imperial College
Chairman: Dr A Sanyal (Babcock Power)
Papers: First 'call' — see loose insertion this issue

1988 (Spring)
(dates to be announced) **Gasification — status and prospects**
Chairman: H B Locke (Codogan Consultants)
Papers: synopses immediately

Autumn
(dates to be announced) **Institute of Energy 4th Fbc conference**
(fuller announcement shortly)

Conferences with which the Institute is in association: in 1986

16/18 Sept **Gas cleaning at high temperatures** (ICHEME/Filtration Society)
Venue: University of Surrey

19 Sept **Aluminium and energy: a 100 years partnership** (Anglesey Aluminium Metal/University College North Wales)
Venue: UCNW, Bangor

In 1987
7/9 April **Energy options: the role of alternatives** (IEE)
Venue: University of Bath

16/18 Sept **Innovation in process energy utilisation** (ICHEME S Wales branch)
Venue: University of Bath

21/23 Sept **3rd European conference on coal liquid mixtures** (ICHEME)
Venue: Sweden

23/24 Sept **Small engines and their fuels in developing countries** (University of Reading)
Venue: University of Reading

Energy efficiency 1986

Oxygen trim controller

Minitrim is a cost-effective oxygen trim controller designed and manufactured by **Westinghouse Electric SA** to provide optimum fuel consumption and burn efficiency in all types of boilers.

Working in conjunction with an *in situ* oxygen analysis probe such as the Westinghouse Model 132 and a load index feedback signal, the Minitrim computes the correct air/fuel ratio required and sends trim signals to adjust the air damper. The system also accepts feedback signals from the trim actuators, inputs of fuel types and flue gas temperature. It therefore monitors the combustion and load conditions continuously to minimise fuel wastage and the likelihood of stack pollution hazards.

With a small, wall-mounted enclosure designed for use in industrial environments, the Minitrim controller can be sited in any suitable point to provide control and front-panel display of a range of parameters. These include oxygen levels, efficiency, set-point, stack temperature, controller output and calibration data.

A set-point programme can be established for each fuel, defining the relationship between oxygen level and the various loads. The built-in microprocessor 'brain' allows rapid configuration by taking the unit through a full cycle of load changes to establish the specific oxygen set-point curve. This is then stored in memory for instant recall.

An advantage is the feedforward control system, which gives a fast response to load changes. The damper is set to a previously 'good' position under the same load conditions and this is then modified and adjusted using the various feedback signals available. This design concept, it is claimed, is an important factor in the high efficiency obtainable with Minitrim.

Output is via a three-term PID current or pulse control signal — 4 to 20 mA or 24 V DC. Dual full set-point programming is supported with a range of alarm features including 'Hi-Lo', oxygen deviation, probe, actuator and control disable alarms.

Minitrim includes a range of safety features such as fail-safe operation and the use of an approved flame arrester head for operation in gas-fired boiler applications.

Reader enquiry no 6/1

mechanical drive purposes. For electric power generation, the turbine drives the generator through an in-line epicyclic reduction gear.

By using high shaft rpm, it is claimed that the turbine is efficient and compact. This results in operating economy and low installation costs.

Reader enquiry no 6/4

Power turbines

Ruston Gas Turbines, the GEC company responsible for gas turbine activities, have just secured a contract worth approximately £20 million to supply power turbines to General Electric of America. The contract covers the manufacture, assembly and test of the ELM 150/3 three-stage power turbine assemblies designed for use with GE LM5000 gas generators.

The LM5000 when used with the ELM 150/3 is a high-efficiency power package for industrial combined heat and power duty or for electric utility applications. Initially designed to produce 33 000 kW, the LM5000 can now be fitted with steam injection to increase the efficiency by over 10% and the power to 50 000 kW. In addition, levels of nitrous oxide emissions have been reduced in order to respond to the environmental regulations now coming into force in the USA and increasingly also in Europe.

Reader enquiry no 6/5

Air pollution and emission analysis

For the measurement, data collection and analysis of air pollution and emission from large boiler systems, **Westinghouse Electric SA** now offer a comprehensive, single source of expertise, through its West German subsidiary, **Maihak AG**.

Companies can obtain a complete emission analysis package, from sample gas pre-cooling apparatus to automatic calibration systems and high-precision gas analysers. A typical emission measurement system from Westinghouse would include a **Maihak MEAC** emission analysis computer and record printer together with items such as automatic condensate drain units and display/adjustment units for sample gas flow.

Maihak's capability covers initial planning and engineering to the

manufacture, start-up maintenance of a complete emission measurement system. The company's expertise can be used for analysis to determine the pollution levels of contaminants as SO₂, NO/NO_x, CO together with reference O₂.

Reader enquiry no 6/6

CF electric van

The **Bedford CF** electric van developed in conjunction with **Chloride Electric Vehicle Systems** incorporates an LCEVS electric train and electronic controller and a road performance compatible with normal urban traffic. It has a top speed of about 50 mph when laden and a 50-60 mile range between charges. Research in the UK has shown that this range amply covers operational needs for average city delivery operations — an application for which the van is specifically designed.

Reader enquiry no 6/7

Trade publications

Oxygen analyser. A leaflet produced by **Raymond Coupland Combustion** describes their new, low cost Serportable oxygen analyser. The instrument will monitor O₂ levels in either mains or internal rechargeable batteries. Other features include a reliable, electro-chemical sensor, easily read LED display and alarm voltage and full-scale alarm output.

Reader enquiry no 6/8

Liquid drainers and gas vents. **Chloride** have produced a brochure featuring their range of float traps for draining liquids and venting gases from pressurised systems up to 250 (3625 psig). The float traps are suitable for handling a wide range of flow media as diverse as sea water and low specific gravity hydrocarbons. Some of the typical applications include draining from air receivers; draining hydrocarbon condensate from lines; and draining oil from compressor seal oil systems. A special feature of the traps is the float lever which allows manual purging to remove any accumulated dirt/sludge in the system. An inspection sightglass is available on some models.

Reader enquiry no 6/9

Packaged plate heat exchangers

R S Stokvis & Sons have introduced a new 'Junior' range of packaged plate heat exchangers, which, it is claimed, deliver instant hot water at flow rates up to 78 l/min. Flexibility in operation is achieved by a built-in time switch providing alternative modes of operation, including normal/reduced flow temperature and normal temperature/off, as required.

Other operational features include an electronic dual-temperature PI controller and motorised three-way valve to provide the variable control procedures. Included in the built-in control panel is the integral wiring system to the controller and the primary and secondary circulating pumps.

Thermometer, safety valve and non-return valves are also included in the package. Interconnecting pipework between pumps, control valve and the plate heat exchanger needs only flow and return connections to the primary and secondary circuits.

Reader enquiry no 6/2

Boiler blowdown receivers

A new range of blowdown receivers has been introduced by **Gestra (U.K.)**. Blowdown receivers handle the high-pressure hot water and flash steam released when steam boilers are blown down. The new Gestra receivers separate this flash steam and vent it safely to atmosphere through an exhaust head, whilst the hot water is held for a time in the blowdown receiver until it cools and can be discharged into the drains system. An optional cooling water system is available to speed up the cooling process.

The new receivers have been designed to comply with pressure vessel standards and can also form part of a complete automatic



New blowdown receiver

intermittent boiler blowdown system. Air-or-water operated rapid action blowdown valves, type MPA, are fitted in the blowdown line from each boiler, and the blowdown requirements are programmed into a seven-day digital timer so that the blowdown is precisely controlled without further manual attention.

An obvious advantage of this automatic system is the time saving compared with manual operation. Other important aspects are the improvement in safety and the improved boiler operation because the blowdown is always carried out precisely in short bursts. It is easy, it is claimed, to program four, 5-s blowdowns a day, for example, on an automatic system, which is better for the boiler than a single 20-s blowdown carried out manually.

Reader enquiry no 6/3

Steam turbines

VAX is a series of modularised and versatile axial flow steam turbines in the range of 4 to 60 MW output. The series, manufactured by **ASEA Stal**, is suitable for many applications.

The modules can be combined for a large variety of extraction — back pressure — condensing cycles for both power generation and

ENERGY WORLD — COMMERCIAL

(Photocopy acceptable)

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

6/1 6/2 6/3 6/4 6/5 6/6 6/7 6/8 6/9

Name

Address

Organisation

round the branches ast Midlands annual inner

The 40th annual dinner of the East Midlands branch was held at the George Hotel, Nottingham on Friday 18 April 1986.

The Toast 'HM The Queen' 'The City of Nottingham' was proposed by *B A Amberlain*, branch vice-chairman. The president of the Institute of Energy, *P C Warner*, replied to the Toast of 'The Institute of Energy' proposed by the Rt Hon *Eric G Varley* PC, chairman, Coalite Group. The branch chairman, *Dr V I Inby*, proposed the Toast of 'Our Guests' to which *M Doherty*, regional energy efficiency officer, replied. *M J En* (Member) was toastmaster for the evening.

During the course of the evening, the president presented the Institute's Special Award to *Jack Limb* (Fellow and a former branch honorary secretary) in recognition of his services to the Institute.

orkshire: installation of ew chairman at AGM

At the annual general meeting of the Institute of Energy, Yorkshire branch, held at AHED House, Ossett on 23 April 1986, *Gordon Williams* was inaugurated as chairman for the 1986-87 session.

A member of the Institute since 1948, *Williams* has been branch honorary secretary for more than 20 years. He retires to become chairman for the second time, having held the office previously some 15 years ago. He is a recipient of the Special Award for Recognition of Services to the Institute. He also received the Steetley Award as an author of the paper *Economisers for modern boilers*, presented to the Yorkshire branch and published in the *Journal of The Institute of Energy* for September 1981.

It is coincidental that Mr *Williams* will be chairman of the branch in this the *Energy Efficiency Year* since he has worked for almost 50 years with Senior *Waters* of Wakefield, a firm known internationally as a manufacturer of fuel economisers and heat exchangers. Mr *Williams* is a Chartered Engineer, Fellow of the Institutions of Mechanical and Plant Engineers and a Fellow of the Institute of Energy.

branch report — North Eastern

WM preparation and utilisation

At a recent joint meeting with the Institution of Chemical Engineers, Dr *Anjum* of Foster Wheeler Power Products described the preparation and



1



2



3

North West annual dinner: 19 February 1986

The annual dinner of the North West branch was held at the Manor Hey Hotel, Urmston, Manchester on Wednesday 19 February 1986. The *Loyal Toast* was proposed by *B N Adshead*, branch chairman. The president of the Institute of Energy, *P C Warner*, (picture 3), replied to the Toast of 'The Institute of Energy and this the North West branch', proposed by

the principal guest, *J H S Marris* (picture 2). *V O Vesma* (Member) replied to the Toast of 'Our Guests', proposed by the branch chairman. In picture 1 we show (left to right) *V O Vesma* (Member); *P C Warner* (president, Institute of Energy); *B N Adshead* (North West branch chairman); *J H S Marris* (principal guest); and *E F Curd* (North West branch vice-chairman)

utilisation of coal water mixtures (CWM). This fuel consists of finely ground coal which is kept in suspension in water by several chemical additives.

Such CWMs possess similar properties to conventional heavy fuel oil so allowing the conversion of burners in oil-fired boilers to coal water-fired systems.

Dr *Anjum* thought that CWMs are an economic alternative to oil. He outlined the advantages of the technology such as the low investment costs, relatively short payback periods, few safety problems, simple transport and handling systems.

Several problem areas were identified during the talk that have been encountered during the conversion of boiler plant to CWM-firing. These

included the re-designing of the pumps and pipework to cope with the mixtures, the shorter life expectancy (approx 2000 hours) for the atomisers and the fouling problems caused by the agglomeration of particles during the combustion phase.

During a lively question period it became apparent that the principal market for the technology will probably be the smaller industrial boilers and not the large scale power generation sector. Dr *Anjum* concluded that if the price of oil and coal remain at current levels then there would be relatively few opportunities for CWM development in the UK.

ANDREW W COX/PETER ABOLINS

Obituary

H E CROSSLEY OBE 1904-1986

Many members will have heard with deep regret of the sudden death of Dr H E Crossley at Beckenham on 1 January 1986 at the age of 81. A warm and friendly personality with an infectious sense of humour he will be remembered for his scientific work on the behaviour of fuel impurities in relation to the performance of power station boilers and for his distinguished services to the Institute and to fuel technology.

Harold Edgar Crossley was born in Manchester and took the degree of BSc Tech at Manchester University in 1925. He spent two years as a chemist at Barton power station, Manchester, before joining the scientific staff of the Fuel Research Station of the Department of Scientific and Industrial Research at Greenwich in 1927. He remained at Greenwich until 1948 specialising in the analysis of the inorganic constituents of coals and working in close collaboration with the Coal Survey laboratories. He revised and improved analytical methods for the constituents of coal ash and a joint study with the Geological Section produced the well-known King, Maries and Crossley formula relating mineral matter to fuel ash and sulphur contents. Wartime investigations on coal gasification led to studies of the behaviour of trace elements such as arsenic and phosphorus during combustion in deep fuel beds and to schemes for the potential recovery of the semi-conductor germanium by the gasification of selected coals from the Northumberland and Durham areas. He obtained the degrees of MSc and PhD in the University of London whilst at Greenwich.

The Boiler Availability Committee comprising the Watertube Boilermakers Association, the then British Electricity Authority, the Fuel Research Station and the British Coal Utilisation Research Association had been set up in the early 1940s to study the serious problem of external deposits and corrosion in boilers. Edgar Crossley represented the FRS and he was one of the first to classify deposits in three main types: sintered and fused, alkali matrix, and phosphatic. From his meticulous laboratory work and field trials with selected coals he was able to produce a good correlation between the incidence and severity of fouling in

travelling-grate-fired boilers and the amounts of chlorine, sulphur and phosphorus in coals. He was always one of the first to join the younger members of the investigating teams in climbing inside the boilers at the end of a trial to collect samples of deposits and flue dusts. He was fond of telling the story of how the chief chemist of the London power company first met his future wife, then at BCURA, inside a Battersea boiler.

In 1948 he left the DSIR for the Chief Engineers Department of the British Electricity Authority at the London headquarters and he was chairman of the technical committee of the BA committee from 1958 to 1963. He continued to be responsible for the initiation of full-scale combustion and fuel investigations and he made a special study of the microscopy of industrial dusts in relation to fouling and air pollution. He took particular pleasure in showing visitors his album of colour slides and photographs of fly-ash and deposited solids.

He became deputy director of the Operations Branch of the Research and Development department of the Central Electricity Generating Board and subsequently the chief fuel technologist, a post he held until his retirement in 1971.

He joined the Institute as a Member in 1947 and became a Fellow in 1952. After election to Council he became a vice-president and began in 1957 what was to be a long period of devoted service as an honorary secretary. Edgar always believed that as the president of the Institute would normally be elected by Council for a period only of one year, the honorary officers were key figures in guiding and promoting long-term policy on such matters as the training of fuel technologists, relations with other societies and institutions, and national energy policy. His scientific work over the last two decades was recognised by the award of the Melchett Medal in 1962, and in 1964 he succeeded John Duckworth as president, the first time a member of the electricity generating industry had been elected. In the conduct of Council affairs and in visits and contacts with branches at 'grass roots' level he showed how good a speaker and communicator he was. If a particular problem, whether scientific or institutional, was proving difficult to resolve he was quite prepared to act as devil's advocate, 'trailing his coat' as he so often said. His presidential address, on a similar theme to his Melchett Lecture, described developments in power station

plant and the contribution of the technologist.

After his presidential year of office would have been quite in order to retire to the 'back benches' of Council but he willingly accepted co-option back as an honorary secretary with special responsibilities for overseas affairs, visits abroad and the presentation of papers to World Power Conferences and other international meetings. This provided him with a fund of personal and institutional contacts in fuel technology worldwide. He was the driving force behind the arrangement for what turned out to be a successful North American Fuel Technology Conference in Ottawa in June 1970 and the close association of the Institute now has with institutions and learned societies in the USA, Canada, France, Japan, Germany and Australia springs from his activities as the Institute's foreign secretary.

In 1968 he delivered the 17th Science Lecture in London at the invitation of the BCURA council and his services to the Institute and to fuel technology were recognised by election as an Honorary Member in 1970 and an award of the OBE in the New Year Honours 1971. Following his retirement from the CEGB in the summer of 1971 he relinquished all offices with the Institute although he was a regular attendee at annual general meetings and luncheons a number of years.

In retirement he was able to give more attention to his main hobby of iris cultivation and breeding of irises, a horticultural interest that began when he was at Greenwich. He had joined the British Iris Society in 1950 and was chairman of the Kent group in the 1960s. While on a visit to the World Power Conference in Melbourne in 1967 he was able to gain an insight into Australian techniques of iris cultivation and transport over long distances. Subsequently the British Iris Society was able to introduce new classes from the USA. Several of his seedlings won awards and were registered between 1967 and 1961.

Edgar's first wife, Nora, died in 1967 after a long illness and much sympathy extended to his second wife, Peggy, after her sudden bereavement.

GORDON WHITTINGHAM
(Past president and Senior Fellow)

DONALD HICKS OBE 1902-1986

Donald Hicks (Senior Fellow) OBE MSc FRSC MICHemEng died on 30 January 1986, aged 83. Although a small man physically he was full of enthusiasm and energy with a keen analytical mind. He had a distinguished career in the Department of Scientific and Industrial Research and the National Coal Board. He joined the then Institute of Fuel in 1946, and served on Council from 1962 to 1965.

Donald Hicks was educated at the Treforest School of Mines from 1919 to 1924 taking courses in chemical engineering and fuel technology; he continued with part-time courses at the Sir John Cass Institute (colloid chemistry) and Chelsea Polytechnic (geology) obtaining a BSc (Hon) in chemistry and a MSc in fuel refractories. His first appointment was at the Fuel Research Station, DSIR in 1925 where he spent four years on research programmes before moving to Cardiff as officer-in-charge of the Coal Survey Laboratory

dealing with all Fuel Research Board activities in South Wales. In 1928 he moved back to London as superintendent of the Coal Survey Organisation.

On 1 January 1947 he became director of Scientific Control, NCB in charge of general duties for quality control and the Coal Survey in the newly nationalised industry. In the next few years he showed his first class organisational ability when, starting with a very few individual colliery laboratories (mainly small), he set up a complete Scientific Service for the NCB with good laboratories in a

as, and special Divisional laboratories for co-ordination and arch on relevant local and national ters. This organisation involved the uipment of a large number of staff. e success of this service (although with e changes as the NCB's organisation aged, particularly in recent years) has ally withstood the test of time, and s how well this difficult job was e. During this period he also formed eveloped the Board's operational arch group (known as the Field estigation Group). Here again he ved his great enthusiasm and hard k and built up this group to be the est of any British OR organisation, ring and writing widely on this ect; he became a founder member later president of the Operational earch Society. He was interested in y other aspects of the industry, ibly in dust and pneumoconiosis. bout 1957 he left the Scientific artment and became for a few years member of the East Midlands sional Board before returning to don and science as director-general of British Coal Utilisation Research ociation. I am told he surprised the f by reading everything concerned the research station. n retirement he moved to Chepstow, did not stop working and writing. He ed out an investigation for the DHS ationalising purchasing, and prepared agnum opus on the service as a whole h ran to some 600 pages, but this was ublished possibly because his onal views crept in from time to time! attended church regularly until bled by emphysema and, I erstand, in his last years his main ling was theology. onald Hicks could have been termed orkalcoholic', but in his young days as a good tennis and billiard player, he had a gentle and friendly

disposition. I knew him as a colleague, friend, and for part of the time as my director, for close on 50 years, and he was always a friend of his senior staff. He is survived by his wife, May, to whom we send our sympathy. He will always be remembered by his staff and friends who survive him.

D A HALL
(Senior Fellow)

We also publish below a further tribute to Donald Hicks from Dr L C F Blackman (Senior Fellow), who is also a former director-general of the British Coal Utilisation Research Association.

I am sure that all my former colleagues at BCURA will share my sorrow at the death of **Donald Hicks**. During his period as director-general, from 1962 to 1967, he fought hard for the continued independence of what he thought was one of, if not the, finest coal research laboratories in the world. Any suspicion that he was an 'NCB plant' was quickly dispelled.

Surprisingly, for a man whose career was spent largely in scientific services, he quickly became convinced that research and development was vital for the future of the coal industry.

Early in his reign he urged the introduction of a central scientific computer, and encouraged staff at all levels and ages to master its use; he supported the preparation and publication of the comprehensive book *Combustion of pulverised coal* by Field, Gill, Morgan and Hawksley; and he supported the introduction of advanced instrumentation and data logging for the large-scale pulverised coal combustion rig.

An example of his political astuteness was the defence of the early research on fluidised combustion. After powerful opposition from a major sector of the

Membership, the Research Committee quashed the programme. Donald secretly allowed limited work to continue using his contingency fund, and when further good results were obtained he managed to persuade the chairman of the Committee to have the earlier disastrous decision reversed — thus opening the way for the highly important development of atmospheric pressure industrial boilers and the pressurised system for power generation.

Another (earlier) example of his keen perception was his attitude towards a proposed contract from the CEGB for the development of a 2500°C coal combustor for MHD power generation. Once satisfied that the relevant BCURA staff were confident that they could meet all the seemingly formidable challenges, he cut across the time-honoured departmental organisation by setting up a highly autonomous Project Team for the duration of the (successful) research and pilot-scale engineering work.

Two other notable qualities were his faith in the young, and his constant quest for scientific and professional excellence. And although he was usually closely concerned with the detail of the major work programmes he never interfered with the authority of his senior staff.

Perhaps a fitting way to end this tribute to Donald Hicks is to cite two personal experiences. When I joined BCURA in 1964 as director of Basic Research — with no experience of the coal industry — he advised on my first day that I should 'quietly relax' into the subject. And when I asked how he would like to spend his last day at BCURA he requested that he might have a simple lunch at my nearby home. Both actions were typical of this most modest, hard-working, inspiring and wholly lovable man.

L C F BLACKMAN
(Senior Fellow)

New members Recent elections and transfers)

Flow

Christopher William Lewis, Energy
lies Unit, Strathclyde University
(transfer)

James Ewart Munro, Shell
earch, Chester (transfer)

Keith Hopper Tanner (transfer)

ember

Alan Beddoes, East Midlands Gas,
field (transfer)

Charles Stephen Cahill, Electricity
ncil, London

Joseph Kwok Chu Chan, Troup
aters & Anders, London (transfer)

Charles Donald Chandler

Charles Keith Jacques, University of
ing

Gareth Jones, Oscar Faber, St Albans,
Herts

Robert John Kennett, Associated Heat
Services, Notts

Ian John Masters, Emstar, Shropshire
(transfer)

Marion Rachel Palmer, British Gas Corp,
Solihull

Mukhtar Ahmad Sahgal, Crosfield
Chemicals, Warrington

Sommerville David Telfer, Hulley &
Kirkwood, Glasgow

Anne-Marie Warris, Babcock Power,
London (transfer)

Technician Engineer

Stuart McLean

Associate

Shyamal Chakravarty, Tata Iron & Steel,
India

Richard David Kyle, Manor House Press,
London

Nigel Anthony Skeet, Celcon, Grays,
Essex

Graduate

Manoj Chohan

Mark Andrew Conway, Munters Rotaire,
Huntingdon, Cambs

Christopher David Haigh, NIFES,
Altrincham, Cheshire

Graham Roy Hazell, Haden Young,
Southampton

Simon Dominic Mahoney, Energy
Control, Maidenhead, Berks

Kevin Neil McGinn, British Steel Corp,
Scunthorpe

Goffrey Howard Peters, Austin, Smith,
Lord Engineering, London

Ian Weslake-Hill, University College,
Cardiff (transfer)

Philip Mark Wilkinson, GEC Power
Transformers, Stafford

Mariusz Zmija, Causeway Steel
Products, Gravesend, Kent

Student

Guy Stewart Anderson, Simon
Engineering Labs, Manchester

(Institute news continued on page 18)

REGISTER OF ENERGY COURSES

Members are invited to make use of the Institute of Energy's national register of energy courses, through which we can supply salient details of forthcoming courses of all types. As well as the member's name and address, we need to know (a) the specific subject in which he is interested; (b) his present level of technical qualification; and (c) the preferred geographical location. Only details of suitable courses will be sent in reply.

We take this opportunity of listing a selection of courses due to start in the near future, and details of each can be obtained by quoting the reference number shown against the entry. Please enclose a stamped addressed envelope.

Course No 42-330.2

Title: Fundamentals of reservoir engineering.

Duration: 5 days.

Location: Heriot-Watt University, Edinburgh.

Starting: 4 August 1986.

Content: Introduction to reservoir engineering. Petroleum reservoir geology. Reservoir rock properties. Fundamentals of fluid flow. Reservoir fluid properties. Reservoir drive mechanisms. Reservoir performance prediction using the material balance equation. Immiscible displacement and waterdrive.

Course No 42-330.3

Title: Fundamentals of well test analysis.

Course No 42-330.3 (continued)

Duration: 5 days.

Location: Heriot-Watt University, Edinburgh.

Starting: 11 August 1986.

Content: Introduction. Drawdown testing and semilog analysis. Build-up testing and the Horner plot. Wellbore storage and type curve matching. Linear discontinuities (sealing faults). Late time boundary and depletion effects. Early time near wellbore effects. Vertically fractured well. Dual porosity and layered systems. Variable rate analysis methods. Constant pressure, upper or lower boundary. Distributed pressure measurement.

Course No 42-330.4

Title: Practical petroleum geology.

Duration: 5 days.

Location: Heriot-Watt University, Edinburgh.

Starting: 11 August 1986.

Content: Basic geology concepts. Sedimentary rocks. Exploration geology. Practical formation evaluation.

Course No 42-330.5

Title: Fundamentals of formation evaluation.

Duration: 5 days.

Location: Heriot-Watt University, Edinburgh.

Course No 42-330.5 (continued)

Starting: 18 August 1986.

Content: Historical introduction. Formation properties. Sources. Theory and development of electric logging. Theory and development of porosity logging. Theory and development of lithology logging. Borehole environment. Practical logging combinations. Logging programmes and procedures. Lithology response of logs. Wells interpretation. Complex lithology. Carbonate evaluation. Shaley sand evaluation.

Course No 42-330.6

Title: Production technology

Duration: 5 days.

Location: Heriot-Watt University, Edinburgh.

Starting: 25 August 1986.

Content: Part 1 — Well completion; subsea completions; wellhead systems; early production systems (EOP); perforating; well servicing fluids; completion programmes; well productivity; vertical lift performance; well performance/tubing selection.

Part 2 — Remedial/stimulation treatments; well diagnosis; acidisation; fracturing; artificial lift processes.

Institute news (continued)

Personal

A M Allen CBE has been re-appointed chairman of the United Kingdom Atomic Energy Authority until 31 December 1986. Mr Allen has been chairman since 1 October 1984.

The Secretary of State for Energy has appointed four senior officials of the National Coal Board as full-time Board members for a period of five years from 1 April 1986. The officials are: **M H Butler**, full-time finance director; **M J Edwards**, commercial director; **K Moses**, technical director; and **J H Northard**, operations director.

At a board meeting of the Watt Committee on Energy on 15 April 1986, **Dr J H Chesters*** OBE FRS FEng (Honorary Fellow) signified his retirement (effective on 30 April), on

approaching his 80th birthday, from the post of chairman of the Watt Committee. He had been chairman since the formation of the Watt Committee in 1976, and it is generally agreed that its character and achievements have been largely due to his dedication and hard work. He was an active and successful fund-raiser as well as the leader in the Committee's professional role.

Dr Chesters described the circumstances in which he was elected chairman of the Watt Committee in his 1980 Wilson Campbell Memorial Lecture at the University of Newcastle upon Tyne, entitled *The growth of an idea*. He presented the concept of a consultative body formed by British professional

institutions in a very wide range of disciplines, all concerned with energy.

Dr A F Ellis (Fellow) is the new head of the Major Hazards Assessment Unit (MHAU). He joined the unit in 1983 and has been its acting head since July 1986. The appointment is within the Health, Safety Executive's Technology and Pollution Division (TAPD) and is based at the Bootle HQ of TAPD.

Born in Swindon, Dr Ellis graduated in chemical engineering from Loughborough University and took his PhD from Loughborough University. He was appointed technical assistant to the alkali inspector in 1971 and, after promotion to district alkali inspector seven years in Manchester.

Dr Ellis acted as a consultant on major hazard control to the International Labour Organisation in India following the Bhopal disaster.

*A photograph of Dr Chesters and a brief biographical note were published on p 23 of the February 1986 issue of *Energy World*

CONFERENCES

following conferences, courses and meetings are organized by bodies other than the Institute of Energy. Institute conferences please see page 13

July 1986

International computers in engineering/Pressure vessels and piping

Conference and exhibition, Chicago (USA), 20-24 July 1986.

Details from American Society of Mechanical Engineers, 345 East 47th Street, New York NY 10017, USA (tel 212-705-7100).

Use of computers in the coal industry

World conference, West Virginia University, Morgantown (WV, USA), 30 July 1986.

Details from Department of Mining Engineering, West Virginia University, Box 6070, Morgantown, WV 26606-6070, USA (tel (304) 293-5695).

August 1986

Chemeca 1986

Fourteenth Australian chemical engineering conference and exhibition, Adelaide (Australia), 19-22 August 1986.

Details from Dr G T Williamson, Conference sec, Chemeca 86, SA Institute of Technology, PO Box 1, Ingle Farm, South Australia 5098, Australia (tel (08) 2055; tx 82505).

Energy conversion

Conference, San Diego (CA, USA), 24-29 August 1986.

Details from Dept of Meetings and Positions, American Chemical Society, 5 Sixteenth St, NW, Washington, DC 20036, USA (tel (202) 872-4401).

September 1986

Renewable energy

Exhibition, Herning (Denmark), 9-14 September 1986.

Details from A/S Herning-Hallen, 7400 Herning, Denmark.

Development of highly active waste conditioning at Sellafield

ES lecture by Mr Larkin (BNF), London (ICE), 11 September 1986 at 10h.

Details from BNES, 1-7 Great George Street, London SW1P 3AA (tel 01-630 2255).

Modern coal mining technology

International symposium, Fuxin (China), 7 September 1986.

Details from Prof Dr Ing W Vogt, Institut für Bergbaukunde und Wirtschaftslehre, Erzstrasse 20, 392 Clausthal-Zellerfeld, FRG (tel (0523) 722286; tx (09) 53828 tu clz).

Pacific petroleum conference

Second international conference, Singapore, 16 and 17 September 1986.

September 1986 (continued)

Details from conference manager, Times Conferences Pte, 1 New Industrial Road, Singapore 1953 (tel 2890507/2848844 extn 481-484; tx RS 257 13).

'Alara': quantitative optimization techniques for radiation protection in the nuclear industry

Symposium, London (ICE), 18 September 1986.

Details from Institution of Nuclear Engineers, Allan House, 1 Penerley Road, London SE6 2LQ (tel 01-698 1500).

Environmental contamination

Second international conference, Amsterdam (Netherlands), 23-25 September 1986.

Details from Dr H Charcosset, Institut de Recherches sur la Catalyse, 2 av A Einstein, 69626 Villeurbanne cedex, France (tel 78933471; tx 900225 CNRS VILRB).

September/October 1986

Energy and development

International scientific conference, Zagreb (Yugoslavia), 29 September-3 October 1986.

Details from Yugoslav Scientific Forum, PO Box 359, Kneza Milosa 10, YU — 11000 Beograd, Yugoslavia (tel (011) 330 641).

October 1986

High-temperature alloys for gas turbines and other applications

Third conference, Liège (Belgium), 6-9 October 1986.

Details from D Coutouradis, Non-Ferrous and New Materials Branch, Centre des Recherches Metallurgiques, Rue Ernest Solvay 11, B-4000 Liège, Belgium (tel (041) 527050; tx 41/202 crm b).

Reliability and maintainability

Fifth international conference, Biarritz (France), 6-10 October 1986.

Details from conference secretariat, ADERA-CEA, BP 48, 33166 Saint-Médard-en-halles cedex, France.

Continuing education and training

First European congress, Berlin, 9 and 10 October 1986.

Details from Spectrum Communications, GmbH, Xantener Strasse 22, D-1000 Berlin 15.

Iron and steel pollution abatement technology

Symposium, Pittsburgh (PA, USA), 14 and 15 October 1986.

October 1986 (continued)

Details from Gary Amendola, US EPA, 25089 Centre Ridge Road, Westlake, OH 44145, USA (tel (216) 835-5200).

Energy engineering

Ninth world congress, Atlanta (GA, USA) 14-16 October 1986.

Details from Association of Energy Engineering, ste 340, 4025 Pleasantdale Road, Atlanta, GA 30340, USA.

Energy and environment

Exhibition, Saarbrücken (FRG), 15-19 October 1986.

Details from Messegelände, Saarmesse, D-6600 Saarbrücken, FRG (tel 0681) 53056.

Combustion 86

Fifty-second annual conference and exhibition, Croydon, 16 and 17 October 1986.

Details from Combustion Engineering Association, Mount Lodge, Station Parade, London Road, Sunningdale, Berkshire SL5 0EP (tel (0990) 25035).

Joint power generation

Conference, Portland Hilton Hotel (OR, USA), 19-23 October 1986.

Details from American Society of Mechanical Engineers (see address above).

European petroleum

Conference, London, 20-22 October 1986.

Details from SPE Meetings Department, PO Box 833836, Richardson, Texas 75083-3836, USA (tel 214/669-3377; tx 730989 SPEDAL).

Facing the nineties: new challenges, new solutions

Biennial European petroleum conference (Europec), London (Royal Lancaster Hotel), 20-22 October 1986.

Details from Dean Simmons, Conoco (UK), Park House, 116 Park Street, London W1Y 4NN (tel 01-408 6416).

Alcohol fuels

Seventh international symposium, Paris (France), 20-23 October 1986.

Details from Symposium Secretariat, Institut Francais de Petrole, BP 311, F-92506 Rueil-Malmaison cedex, France (tel (1) 752-62-01).

November 1986

Flue gas desulphurisation

Tenth symposium, Atlanta (GA, USA), 18-21 November 1986.

Details from Jack H Greene, symposium coordinator, MD-60, US EPA, AEERL, Research Triangle Park, NC 27711, USA (tel (919) 541-2903 or J Pekar, (919) 541-3995).

The Chartered Engineering Institutions Technical Affairs Board

This is a committee, originally set up by the CEI, which provides a forum for the engineering institutions to discuss, principally, matters concerned with health and safety in industry. For example, among the items on the agenda of its latest meeting were: *Recommendations on occupational health services, Control of substances hazardous to health and the Petroleum (Consolidation) Act 1928, Model construction requirements for petroleum spirit can and drum stores.* The Fellowship of Engineering has recently agreed to accept responsibility for this committee and will provide the secretariat.

The Institute is at present represented on this committee by *Dr G G Thurlow* (past president), but he feels that there must be someone within the Institute more directly involved in the matters discussed by this committee than he is. This member would therefore represent the Institute better than Dr Thurlow has been able to do recently. If you feel you would like to be considered as the Institute representative, or are able to suggest someone whom you feel would undertake this duty well, would you let the secretary know so that Council can consider our membership of this committee.

Energy resources management: MSc at the Polytechnic of the South Bank

A part-time course (one day per week) will start in September 1986. Applications from those working in energy related industries and local authorities are especially welcomed.

Further information from Colin Sweet, director, Centre for Energy Studies, South Bank Polytechnic, Borough Road, London SE1 (tel 01-928 8989 ext 2596).

Saving energy in local authorities

A four-day residential course will be held in London from 20-23 October 1986; it is designed for energy managers and accountants and is focused on the skills necessary to respond to the Audit Commission.

Further information from Colin Sweet (see address above).

Advances in solid/liquid separation

An international conference on recent advances in solid/liquid separation processes will be held at Battelle Memorial Institute in Columbus, Ohio, from 12-13 November 1986. Subjects to be discussed will include: filtration, centrifugation, dewatering, sedimentation, and equipment.

Further information may be obtained from Phillip Wells, SynerCom, 1989 West Fifth Avenue, Suite 5, Columbus, Ohio 43212, USA (tel 614-488-2403) or (UK enquiries) Ms Renate Siebrasse, Battelle Institute Ltd, 15 Hanover Square, London W1R 9AJ (tel 01-493 0184).

International computers in engineering

This 1987 ASME conference and exhibition will be held in the New York Penta Hotel, New York from 9-13 August 1987.

The main themes of the conference are supercomputer applications and artificial intelligence.

Call for papers

Papers are invited in all areas related to the development, application and research of computers in mechanical engineering. Abstracts should be submitted by 15 October 1986. Further information from American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017, USA (tel 212-705-7100).

Coal and gas conversion

An international conference will be held in Pretoria, South Africa from 24-27 August 1987. The object of the conference is to discuss international advances in technology, economic and research and development in the conversion of coal and natural gas to liquid fuels and chemical feedstocks.

Proposed topics:

- Synthesis gas production from coal or natural gas.
- Conversion of synthesis gas to liquid fuels and chemical feedstocks.
- Coal liquefaction.
- Downstream processing, eg methanol conversion, conversion of lower olefins and hydrotreatment of syncrude.
- Thermodynamic analysis of conversion.
- Process economics.
- Synergism in simultaneous conversion and energy generation.
- Catalysis.
- Future trends.
- Environmental aspects.

Further information from Symposium Secretariat S.3, PO Box 395, Pretoria 0001, Republic of South Africa.

Metallic corrosion

The 10th international congress will be held in Madras, India from 7-11 November 1987. Abstracts of papers are required by 31 December 1986.

Proposed topics:

- Corrosion processes* (mechanistic aspects). Environmental effects (atmospheric, underground, biological, marine, liquid metal, non-aqueous, high temperature, sulphidic and vanadic, molten salts etc).
- Materials aspects* (composition, microstructure, impurities, defects etc).
- Mechanical effects* (stress, fatigue, erosion, cavitation, fretting, embrittlement etc).
- Corrosion control measures* (alloying, surface modification, surface coatings, inhibitors, cathodic and anodic protection, design modification etc).
- Corrosion problems in major industries:* fertilizers, petroleum, chemical, power plants, transport, buildings and bridges, food and beverages, metallurgical and manufacturing industries.

Further information from Prof G C Wood, Corrosion Protection Centre, UMIST, PO Box 88, Manchester, M13 9PL (tel 061-236 3311).