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Institute of Energy 86 May/June meetings

land
 ay (Th). AGM. Coventry Colliery.

th-Eastern
 ay (W). AGM followed by visit to
 tlepool Nuclear Power Station.

th Wales and West of England
 May (F). 14th Annual Idris Jones
 memorial Lecture: *The role of the
 trical supply industry in innovation
 industrial energy utilization*, by Dr
 Churchman (research director,
 tricity Council Research Labora-
 es, Capenhurst). Crest Hotel,
 tgate St, Cardiff.

ional
 May (Tu). AGM. Institute of
 rgy, 18 Devonshire Street, London
 N 2AU at 1030 h.

th Wales and West of England
 June (W). Lunchtime lecture.
 her, faster, safer, by J E Talbot
 ef systems engineer, British Aero-
 ce). NCB Coal Research Establish-
 t, Stoke Orchard, Cheltenham,
 s at 12 noon. Admission by ticket
 Special Announcements, p 22).

rth-Eastern
 June (F). Social evening with wine and
 ese. The Newburn Hall Motor
 eum, Newburn, Northumberland.
 se arrive between 1900 and 2000 h.

Have you a viewpoint?

On occasion the inside back cover of this publication, more properly reserved for advertising, has carried a small panel urging 'head hunters', and other agencies, to 'make this page work for you'. This month, incidentally 'they' do — (pause to look, please). This month, also, that same message comes 'up front' — in less peremptory phraseology, perhaps, and more by way of invitation. In short, your editorial department is looking for a commentary each month: a viewpoint, perhaps more nearly fits what we would like to receive, expressed briefly in not more than 500 words, and it might be topical to one or other of the many burning issues of the moment, or of general, or historic, interest pertinent to the energy disciplines.

To some, those who perhaps listen only to their own counsel, persons holding strong viewpoints are sometimes dismissed as having a 'bee in their bonnet', or the other extreme of riding a hobby horse. The viewpoint expressed may indeed be a 'stinger', or the force of the idea may well seem to embody all the energy of the proverbial 'galloping major'. And why not — so long as novelty prevails, and the truism is not blunted by repetition, or mere emotion? No matter. We will take both 'bees' and 'horses' in our stride, suitably cloaked under the generic heading 'viewpoint' which we hope very much will stimulate, in turn, more correspondence to this publication, even articles subsequently in support of, or against, the 'viewpoint' earlier argued.

The bulletin, *Energy World*, is of course members' own publication: it is (but not in the commercial publishing usage of that word) a controlled publication and its life blood draws, or should substantially be drawn from the expertise of the Institute's membership. Nonetheless, a quite surprisingly large proportion of the material featured in this bulletin in the last year came from authorship outside of membership. That is an observation made in passing, and one that needs to be seen in perspective. Nonetheless, the invitation is here, and now. Over to you.

Editor

The simple point – economy in management

Both of your correspondents, John L Bindon and L G Brookes attack me by name (*Energy World*, February '86) but both fail to address the simple point of my letter.

Mr Bindon quotes sales of Medallion Homes and electric storage heaters. These have more to do with the expensive advertising campaign at taxpayers' expense of the electricity authorities than with any inherent fuel efficiency considerations.

Medallion homes may save energy as compared with poorly insulated and draughty houses heated by electric fires. The glowing examples quoted by the 'Think Electric' advertisements no doubt save money as compared with the ill-matched or obsolete equipment they have replaced. Such cases do not show that electricity is of itself a good

way to supply low temperature heat.

Confucius said that a mark of the mean man is to know the price of everything and the value of nothing. Dr Brookes should realize that measurement merely in money terms is no substitute for intelligent husbandry of resources. Mr Bindon speaks of the customer's right to choose but ignores the effects of differential taxes and subsidies, also those customers who find themselves, often without much choice, in all-electric dwellings. Naturally, an individual customer will choose according to short-term cash price criteria. That is why it is so important to provide a true and fair choice including the options of gas, solid fuel and CHP/DH wherever possible.

Neither correspondent recognizes

my call for long-term economy in management of our country's resources. No matter how the figures may be massaged, the fact remains that, for low temperature space and water heating, gas is more efficient than electricity and CHP/DH is more efficient than either, not to mention wood which is often free. It should be obvious that a fair choice and impartial advice can best be provided by a local organization offering all available heating options as well as means of conservation.

These ideas are developed more fully in the manifesto of The Green Party, a document which contains more sense on energy policy than most engineers realize.

OWEN DUMPLETON (*Fellow*)
Tyne and Wear

A harsh reality that again highlights the comparable gains in CHP/DH schemes

The sad fact that elderly people have again this winter died from cold in inadequately heated homes is the harsh reality that is resultant in the lack of a coherent UK energy policy.

Fuel and electricity costs are expected to rise as our fossil fuels become scarcer and harder to extract, so this problem is likely to worsen in the years ahead. However, an energy infrastructure development which has been available for years, and has been successfully exploited in Scandinavia and W Germany, is being overlooked for the UK.

The concept of Combined Heat and Power with District Heating (CHP/DH) involves the use of energy that would otherwise be wasted at power stations to supply heat to low temperature city-wide district heating systems. The costs of producing this heat can be very low, as little as 10p/therm, compared to 109p/therm for an electric bar fire. Distribution of the heat involves a new capital infrastructure programme; but, if financed on the same basis as other energy supplies, CHP/DH would still produce heat at 20%–30% below alternative sources, such as gas central heating. More importantly, CHP/DH heat costs are related to repayments on capital rather than on the prices of dwindling fuel supplies, and would be more stable in the longer term.

The injection of the large capital sums required into inner city areas

would provide much needed jobs even before taking account of the income from the scheme itself. Further advantages to the national economy would flow from the conservation of our energy stocks, and reduced imports of natural gas.

The introduction of CHP/DH on a large scale would be greatly assisted by direct government involvement to bring together the various interests

and to ensure that the new development was financed on a comparable basis to our current energy industries.

The Institution of Mechanical Engineers called for more government intervention on energy supply, and predictably, Mr Peter Walker's response was to place reliance on market forces. The failure of such a policy to prevent the needless deaths that have occurred this winter is evident; let us hope that these tragedies will prompt the Government to make available funds for implementing the many CHP/DH schemes that have been proposed.

P S WOODS (*Member*)
Highbury
London

Single energy authority

Owen Dumbleton's suggestion (*Energy World*, November '85, p 2) is long overdue and should be implemented at the earliest opportunity. The example of UNICHAL's 100 or so members, operating comprehensive, autonomous, local energy authorities proves the practicability of CHP as nothing else can. Irrefutable statistics have now been published, for the first time only a few months ago.

The incomprehensible letter from Dr Brookes (February issue) should declare his commercial interest: every time sane and sensible proposals for CHP in the UK are put forward someone, and very often Dr Brookes, pops up to claim economic, technical or some other fanciful objections are overwhelmingly

— obstructive. I know of no one paid further CHP interests and since they are wholly those of the energy consumers at large there can be none; more's the pity. A strong lobby could be irresistible; energy is the keyword.

It is encouraging to see that the House of Commons Select Committee is enquiring into observance and construction of the '83 Energy Act designed to ease us into CHP — and prepared to consider evidence in Appendix 24 of the last report — 31 of April 1983 refers specifically to obstruction of CHP. Day 301 of the Sizewell Inquiry summarized the situation and the demonstrably false evidence given intended to destroy the case for a CHP alternative.

NORMAN JENKINS
Ewshot, Surrey

Technical assistance to developing countries:

What can we do to help?

W Tipler

Introduction

Now that the Institute has adopted a policy on aid to developing countries roughly in line with that proposed earlier (*Energy World*, January 1985, p6), the next move must be to back up this statement of policy by some finite action. The purpose of this short article is to launch a scheme in which the majority of readers will be able to participate, and which will have far-reaching benefits abroad.

Technical literature for developing countries

In many developing countries education at all levels is handicapped by shortages of essential materials — books and writing materials — due to the non availability of foreign currency to import them, or because schools and libraries have been pillaged during periods of unrest — they are often seen as ready sources of fuel by insurgents. At least two voluntary bodies have tackled this problem by collecting books and other materials and distributing them to meet needs elsewhere. However these bodies tend to concentrate upon general reading material and the requirements of schools. The Royal Society of Chemistry has launched a similar scheme concentrating upon the supply of books on chemistry to universities abroad; thus there is no overlap with other bodies. However, this still leaves the whole wide field of engineering uncovered, and it is here that we can help, in a scheme which will also be supported by the Institution of Civil Engineers and the Institution of Mechanical Engineers.

Action

Letters have already been sent to technical universities in our African countries and replies to hand indicate clearly that assistance of the type mentioned above will be greatly appreciated, not only by university students and their tutors but also by practising engineers who are short of reference books, and by students and staff in technical schools.

Therefore YOU ARE ASKED to look through your bookshelves and locate any technical book, journal or paper of which you have no further need. Similarly ASK

your company librarian or university librarian to look through their book stocks for redundant articles on engineering subjects.

Make lists of all the available items and send the lists to:

W Tipler
16 Angus Court
Peterborough
PE3 6BE

Please send only the lists at this stage as storage is quite limited.

From this knowledge of what books, journals or papers are available, they can be 'paired off' with requests received from abroad.

Holders of items for which requests have been received will then be notified. These should then be taken, or sent, to Institute HQ marked for the attention of Mr C Payne for packing and final despatch. This can be an expensive item, but postage charges can be avoided by either taking the items to London when going on other business, or asking a colleague to do so, or by contacting your branch secretary to enquire whether he can suggest a willing carrier — branch officers themselves visit HQ from time to time for the Council meetings, and the standing committees may be able to help.

As already mentioned the final packing for despatch abroad will be done at HQ; shipping to final destination will be handled by voluntary organizations with which friendly relations have been established, or, in some cases, through a London-based company with world-wide operations.

Conclusion

Correspondence already received makes it clear that this scheme will make a real contribution towards the solution of problems of technical education in developing countries, but its success is critically dependent upon support given by readers of this article who are asked to — locate their surplus technical literature.

- encourage their employers to do the same
- tell the writer what is available
- tell the writer of any case of need of which they are aware

Institute of Energy policy statement on aid to developing countries

While the immediate needs of several countries for aid in the form of famine relief bring praiseworthy responses from individual donors, voluntary organizations and governments, repetitions of the disasters can only be alleviated by carefully planned, long-term programmes. In many cases these problems are caused or aggravated by shortages of energy caused by rapid increases in energy prices over the past decade, and by acceleration of deforestation. It is appropriate that the Institute of Energy should be concerned in programmes aimed at relieving the energy problems in developing countries.

To this end, the Institute of Energy will:

- 1 Where practicable, seek to support 'aid' agencies,

irrespective of national or religious affiliation, by bringing to bear the technical and organizational expertise possessed within its membership, depending on what is needed and on the availability of those concerned;

-
- 2 Encourage its younger members to participate in such work in the field;
- 3 Publish articles on problems and projects in developing countries, including their socio-economic facets;
- 4 Encourage the universities and polytechnics to give more attention in their tuition and postgraduate studies to technologies of appropriate scale to solve local energy problems.

Energy for development: what are the solutions?*

The conference concentrated on the implementation of Appropriate Technology in developing countries and attracted some 60 delegates, of whom about one-third were from developing countries. The opening speaker was George McRobie, the former chairman of the Intermediate Technology Development Group (ITDG), who gave an authoritative overview of the Appropriate Technology concept. He reminded the conference that the original aims of the ITDG when it started in 1965 were to develop technologies appropriate to the needs and resources of poor people in poor communities. These technologies were to be relatively small, simple, capital-saving (not labour-saving) technologies that could utilize local resources and local skills, thus enabling the poor to work themselves out of poverty. After 20 years McRobie felt that while the conventional aid

Much work is needed to ensure small-scale technologies are acceptable, economically viable

and development programmes had not reduced unemployment, runaway city growth or foreign currency debts, the appropriate technology approach to development is steadily gathering strength, with Appropriate Technology organizations and centres in about 20 developing countries.

George McRobie admitted that they were wrong in the beginning to imagine that they only had to find solutions to purely technical problems. Much more work is needed to ensure that small-scale technologies are socially acceptable as well as being economically and commercially viable. After giving several examples of different projects, he concluded by pointing out that it is not a matter of one kind of technology for the rich and another for the poor. The industrialized countries also stand in need of technologies that are human-scale, environmentally non-violent, less rapacious in their demand on resources and more sustainable.

The second speaker, Calestous Juma (Science Policy Research Unit, University of Sussex) looked at the response of Kenya and Zimbabwe to the 1973 oil crisis. Both embarked on fuel alcohol projects, but despite initial similarities in their socio-economic settings they followed different project implementation routes. For example, in Zimbabwe some 60% of the plant was manufactured locally. In Kenya whole plants were imported, with the result that a highly sophisticated blending system was used to obtain 93 octane petrol. The preparation for the adoption of this technology in Kenya created enormous problems. The government of Kenya gave over 50% support for their project, but in Zimbabwe the

private sector had to justify the viability of the project before the government would make investment. The result was that Zimbabwe had dramatically lower cost per litre produced than Kenya.

Eight years' experience with windpumps in Kenya — the Kijito Windpump Project — was described by S J Batchelor (Reading University). The project has now produced nearly 100 windpumps for deep-lift operation. These are high-cost, high-quality machines which need to operate throughout the year with perhaps only one visit from the manufacturer for a routine check. The first windmill in 1977 lasted three days and the strategy of the founder of the project, Mike Harries, developed from that initial disaster. Three years of research and field testing followed, with the Overseas Development Administration providing some funds for fatigue testing. The key feature of this work was that it was carried out in Kenya. At present some 120 boreholes with an average depth of 40 m are drilled annually with about one in six resulting in a saleable quantity. Communities of up to 5000 people can be served by one deep-lift machine. Capital costs of diesel pumps and wind machines are almost identical after tax. A major problem was the lack of confidence displayed by government following the failure of many other windmills after a few weeks or months. One reason for the failures was the lack of adequate training. Batchelor suggested a minimum of three weeks' workshop training for three people per wind pump, including experience of working at an exposed height of 10 m. The need for communications to be maintained between the field worker and

One reason for the failures of windmills has been the lack of adequate training

the 'home-based' technical support was stressed. One delegate questioned the philosophy of providing high-cost and high technology equipment, implying that this was contrary to the ideals of Appropriate Technology. This view was not supported as the project had clearly demonstrated that such equipment was the most appropriate for the needs of the people. It was also clear that the technical competence of the local field workers was very well established by the training programme. Nomadic life-styles are not synonymous with technical illiteracy.

A broadly similar conclusion, but from a radically different project and outcome, was reported by J Burton (Reading University). He described some experiences with very small hydro plants, from 10 W to 50 kW, in Columbia. The main problems were not technical, as the local workers are familiar with agricultural machinery, but socio-economic. It

*A conference organized by Prof P D Dunn of Reading University, on behalf of the UK section of the International Solar Energy Society on Friday 13 December 1985, at the University of Reading

necessary to identify and exploit income-generating and load uses for the power which can both fit peasant working patterns and organizational capabilities. One community-owned micro-hydro plant has been operating for 16 years driving a 5 kW sugar cane crusher, but it only needs direct supervision and activity for two days each week, leaving the rest of the week free for alternative diversified income generating activities.

The Commonwealth Science Council's work in the developing world was presented by Dr Azam Khan and an overview of the rapidly developing solar energy programme in the People's Republic of China was given by Zhu Guangji from the Institute of Energy Research, Beijing, who is spending a year with Professor Dunn's Energy Group at Reading.

'Improved' stoves neither more efficient, nor used to designer's criteria

Some useful information on stoves and deforestation in developing countries was given by Jas Gill from the Open University's Energy Research Group. Many 'improved' stoves are not more efficient in practice, nor are they used by villagers according to the designer's criteria.

The conference ended with a structured discussion chaired by Dr John Twidell (Strathclyde University). He asked the delegates to consider the benefits and barriers to successful implementation associated with appropriate Technology. Several benefits were identified including the saving of foreign currency, involvement of both government and people in projects, the adoption of new technology and the learning experiences gained by field workers. The

Benefits identified, but major barriers include insufficient education

Complexity of many projects was seen as both a benefit and a barrier. Major barriers were the high capital cost of some projects, insufficient educational infrastructure, lack of spare parts, bureaucratic self-interested politicians and the involvement of too many western 'experts'.

One last question remained unanswered. Where were the representatives from the UK Department of Energy, Department of Trade and Industry, and the Overseas Development Administration?

C McVEIGH PhD (*Fellow*)

Note:

The proceedings will be published by and available from, the UK section of the International Solar Energy Society, 19 Albemarle Street, London W1X 3HA.

Second International conference

Small engines and their fuels in developing countries

University of Reading, UK
23-24 September 1987

Abstracts of papers (250 words) requested by 30 August '86. Papers to be related to one of the following topics:

- Engines
(technical appraisals 10-100 kW)
- Fuels
(production, utilization, economics)
- Case studies

Conference organization:

The Energy Group,
Engineering Dept
University of Reading
and
Intermediate Technology Power
with
Institute of Energy
in association

Enquiries and information:

Dr G Rice
Conference chairman
Dept of Engineering
University of Reading
Whiteknights
PO Box 225 Reading UK RG6 2AY

China's energy industry Steaming ahead!

Zhou Yougao*

If all domestic electrical appliances in China — refrigerators, TV sets, electric fans, washing machines and so forth — were turned on simultaneously, they would need a power plant with a generating capacity of 1.50 M kW. As China's modernization drive forges ahead and living standards rise, those previous luxuries afforded only by a few in the past are now multiplying at an amazing speed.

But China's energy industry has managed to meet the basic demands of industrial and domestic use; and it is entering a fresh period of steady, balanced and overall development. This owes much to the policy of attaching strategic importance to energy production, which has been promoted to a position of special concern and top priority in the country's planning, investment and capital construction policies.

China is in the last year of its Sixth Five-Year Plan (1981-1985), during which it earmarked around 25% of its 230 billion yuan (about 100 billion US dollars) construction investment for energy. Of 169 key projects in 1985, 60 involve energy construction.

The past few years have seen China making gigantic endeavours to boost its energy production and scoring marked achievements. China generated 376 billion kWh of electricity in 1984, an 87-fold increase over 1949, the year when the People's Republic of China was founded. The 1985 output is expected to reach 400 billion kWh, a 6.4% increase over the previous year, according to Jiang Zhaozu, chief of the Fuel and Power Department of the State Planning Commission.

'On the whole, the energy programme in the Sixth Five-Year Plan is being implemented satisfactorily, and energy production has been pushed ahead at an average growth rate of 5.7% for the past five years. But energy supply is still under heavy pressure, and the supply of electricity is not sufficient to meet demand, especially in eastern and coastal areas where production is developed and population density is high,' Jiang said. So efforts are being intensified to speed up energy development to fuel China's modernization programme. A group of new power plants with a total capacity of 5 M kW will be put into production by the end of this year.

Coal has always been China's major energy source, accounting for almost 70% of its energy raw materials. It has been verified that China possesses coal deposits of up to 770 billion tons. China produced 772 M tons of coal in 1984, 162 M tons more than the 1980 output. The 1985 coal output will top the mark of 800 M tons, according to Coal Ministry officials.

The fact that China's coal industry is developing rapidly is attributed to the country's flexible policy that calls for concerted efforts by the state, collective units and individuals to develop big, medium-sized and small coal mines.

With more money allocated by the state to the capital construction of coal mines, new mines with a total annual capacity of more than 30 M tons have

been put into production in the past three years. There were 21 large open-cast and underground mines with an annual capacity of 17.92 M tons put into production in 1984, bringing about an increase of 11.2% over the original plan, the highest growth rate China has ever registered in coal production.

By the end of 1985, five new mines, with a designed capacity of 17.6 M tons, will be developed, thus raising the total potential capacity of coal mines under construction to a record 150 M.

According to incomplete statistics, there are more than 50 000 small coal pits nationwide run by collective units and individuals. They play a useful auxiliary role in raising total coal output.

China's hydroelectric power, which holds a secondary position to thermal power, has been increasing at an annual growth rate of 9.3% in the past five years, from 58.2 billion kWh in 1980 to 85 billion in 1984. A larger growth rate will have been registered in 1985.

Now China has 19 large hydroelectric power stations in operation, excluding hundreds of small and medium-sized stations.

The Gezhouba Hydroelectric Power Station is the largest one in China. The dam, standing on the main stream of the Yangtze River north of Yichang, Hubei province, was completed in 1982, bringing about a multi-purpose scheme of electricity generation, flood control and irrigation.

Its construction was carried out in two phases: the first phase, with a generating capacity of 965 000 kW, was finished in July 1983 and is now running at full capacity. The construction of the second phase with a designed capacity of 1.75 M kW, is now in full swing.

When the second phase is completed, Gezhouba will produce 14.1 billion kWh of electricity a year. It will not only help alleviate the power shortage in the central China electricity grid, but will also transmit electricity to industrially developed but power-deficient east China.

China leads the world in water resources, theoretically 680 M kW in all, of which 380 M kW are exploitable, according to Lin Bijun, engineer at the Production Department of the Ministry of Water Resources and Electric Power.

'But now only 3 to 4% of China's usable water resources are harnessed to generate electricity. There is still a great potential to tap,' Lin has said.

With an overall nuclear power programme worked out, China is now developing nuclear energy as a supplement to thermal and hydroelectric power. It will make up for the power shortfall the modernization drive may give rise to.

China plans to construct a number of nuclear power plants with a total generating capacity of 10 000 megawatts by the turn of the century. Already in full swing is the building of the Daya Bay Nuclear Power Plant in Guangdong province, South

*Submitted through Xinhua News Agency, London

Canada:

The first International Conference on Circulating fluidized beds

Good progress fundamentally, commercially, but gaps prevent optimization of industrial design

The conference* attracted over 260 participants from 20 countries. Six plenary lectures and 39 papers were presented at the conference, and a special poster session was held for papers reporting on-going research work. The papers submitted for the conference were grouped in five major categories:

Hydrodynamics;

Combustion and environmental pollution;

Design and operating experiences;

Heat transfer; and

Process applications

The conference proved to be an admirable occasion for scientists and engineers, worldwide, to discuss and exchange new ideas, with a good ratio of industrial papers to those from academic institutes. Mostly the papers from universities were focused on the better understanding of some fundamental

aspects of CFB, while large-scale applications were discussed thoroughly in conjunction with recent developments.

At the end of the conference, participants' general opinion was that there had been excellent progress in the whole CFB area, both fundamentally and commercially. CFB technology has become more mature than only a few years ago, and is now an attractive alternative for industrial users. However, there is still more research required on the technology, because, despite all the past research, and large scale industrial exploitation, there are still some important gaps that remain in the understanding of the CFB process that prevent optimization of industrial design. The mechanism of transition from bubbling to fast fluidization, and the exact structure of the fast bed itself, still remain confusing and poorly understood. Very little information on the heat transfer and the combustion kinetics in the fast fluidized beds is known.

F HAMDULLAHPUR PhD

*Organized by the Centre for Energy Studies, Technical University of Nova Scotia, and held in Halifax, Nova Scotia, 18-20 Nov 1985

China's energy industry (continued)

China, and the Qinshan Nuclear Power Plant in Zhejiang province, East China.

Once a poor country dependent on foreign oil, and now a crude oil exporter, China has made mammoth efforts in oil exploration and exploitation. China's oil industry has become one of the mighty pillars of the national economy. Oil output has topped 100 M tons mark for the six consecutive years since 1978 and reached 114 M tons in 1984, advancing China to the rank of the world's major oil producers. The 1985 oil output is expected to come to around 120 M tons.

China now has reversed a situation in which exploitation was quicker than exploration. 'China's petroleum industry is entering a new period of steady increase and development, in which the top priority is given to geological prospecting to augment the oil reserves on a large scale,' Tang Ke, Minister of the Petroleum Industry, has said. 'At the same time, we will try to update our oil technology, learn and import advanced technology and equipment from other countries and conduct petroleum technology cooperation with them.'

Sino-foreign joint efforts to prospect for, and exploit, offshore oil are progressing well, with two rounds of bidding, having yielded encouraging results. In the continental shelf of 1.30 M km² seven oil and gas-bearing fields have been discovered in the Bohai Sea, South Yellow Sea, the Pearl River basin, the Beibu Gulf and the Yinggehai Sea. So far, test wells have been drilled in these areas, of which 35 are rich in oil and gas. Four high-yielding wells in the Chengbei Oilfield in Bohai Sea will go into production before October this year, and the Wei-10-3 Oilfield in the Yinggehai Sea, off southern China's Hainan Island, will go into production before 1986.

China's offshore oil reserves have been verified at

8 000 M tons, one of the richest such areas in the world. It is estimated that by the end of the century, China's offshore oil output will have reached 80 M tons a year.

According to the State Planning Commission, China is striving to produce 1.2 billion tons of standard coal by the year 2000, twice the 1980 figure, so as to provide adequate energy to accelerate the country's modernization as well as to fuel more household electrical appliances for the people.

Gasification — status and prospects

The conference is intended to interest:

- i primary fuel suppliers
- ii process plant contractors
- iii equipment manufacturers
- iv users and potential users
- v research workers
- vi planners and economists

Abstracts, of about 100 words, are invited from intending authors, and should reach the Editor by 30 June 1986 for conference in 1988

(see 'call for papers' *Energy World* (March))

There are still opportunities for — and effort needed from — UK manufacturers

John Flynn*

Energy conservation is playing an increasingly important role in industrial thinking in Spain and the Spanish government is making renewed efforts to encourage its domestic application, too. It is opportune now, with Spanish accession to the European Community, to look at the possibilities of this expanding market

Many of Spain's current economic problems, as in other industrialized countries, have their origins in the oil price rises of the mid and late 70s. Up to that time Spanish industry had been able to achieve astonishing rates of growth, largely as a result of the high import tariff barriers that protected it from the effects of international competition. Helped by a strong agricultural base and an increasing influx of tourists, foreign currency receipts were sufficient to meet the country's requirement for imports of energy products. The weight of the more costly oil products produced a severe imbalance in the economy. At the same time, in this post-Franco period inflation was building up as well as a large public expenditure deficit. Unemployment was also beginning to grow.

The Socialist government that came into office at the end of 1982 set, as their main economic priorities the reduction in the rate of inflation, then at 14.4%, control over public expenditure, modernization of traditional sectors of industry, such as steel, ship-building and textiles, and the reduction in the rate of salary increases; all this in an effort to hold back the rise in unemployment. Greater efforts are also being made to increase exports and reduce the oil import bill. In most of their objectives the government is being reasonably successful. The inflation rate in 1985 was down to around 9% and the government hopes that it can be reduced to 7% by the end of the year. The public expenditure deficit has been reduced from 6.5% GDP to 5.5% GDP and exports have increased in the last year by over 30% in value terms. Only in the area of unemployment has the government been less successful, and this is in part due to the massive shake-out which is going on, not only in the traditional industries, but in many other sectors where the need to become more competitive is forcing companies to examine manpower levels, reduce costs generally and invest in new machinery and techniques.

Not unnaturally, the Spanish government increasingly sees energy conservation as one of the key areas for bringing down import costs. One of the main aims of the recently revised National Energy Plan is to decrease Spain's dependence on large and expensive imports by developing her indigenous energy resources. Spain currently imports about 65% of all energy including 90% of her crude oil requirement. The government is therefore actively encouraging companies to change from fuel oil to coal-fired systems and to install energy conservation equipment. Incentives include grants, soft loans and other aids as well as 95% import duty exemption on

any equipment where there is no comparable source of manufacture in Spain.

Until fairly recently this was an area neglected not only in Spanish industry but also in private housing construction as well. At least half of Spain experiences a Northern European winter, yet few houses have roofing insulation or lagging.

In industry, little attempt is made to re-cycle waste heat and the heat pump is only just becoming used in some factories. The opportunities for British manufacturers will not lie in the low cost insulating products but in more sophisticated items of control. In the south of the country, which as everyone knows enjoys sunshine at least ¾ of the year and rarely has below freezing temperatures, little work has been done on solar heating for power or use of solar energy for producing electricity. In these areas, too, opportunities are available for British companies but again not in low-value products.

In general terms British manufacturers should find possibilities for exports to Spain in areas concerned with heating and lighting economy in building monitoring and control equipment, coal conversion equipment, fluidized bed combustion, waste heat recovery equipment, high radiant type gas heaters and more efficient boilers. Spanish official bodies are also very interested in the latest technology on the utilization of energy resulting from the treatment of refuse and sewage.

Traditionally, the Spanish market has been difficult to crack for British exporters. It requires dogged perseverance and an active presence in the market either through an agent or a representative office. Spanish companies do not buy sight unseen, but they should not put off the potential exporter because the rewards of the market will far exceed the effort put into them.

While it is true that British exporters have been doing very well in this important market of 38 million consumers during the last few years, and that British exports in 1984 reached £1.3 billion, a 7.4% increase over 1983 (when in 1981 they amounted to £753.4 million, a 75.5% increase in only three years), we can do better. Other countries have paid more attention to Spain than has the UK; but there is no reason why the UK should not improve her market share. The incorporation of Spain into the European Community will involve the gradual dismantlement of her present import tariff barriers to be reduced roughly by half within three years of accession.

Note:

Those concerned to learn more about the market in Spain should in the first instance contact the Spanish Desk of the Exports to Europe Branch of the Department of Trade & Industry, tel: 01-215 4200 or local DTI Regional Office.

*Commercial Counsellor, British Embassy, Madrid

Dr Paul Eisenklam reviews a selection

Oil in the sea – inputs, fates and effects

National Academic Press, Washington
1985 601 pp. £41.80

A book for the marine biologist, the marine environmentalist concerned with oil spills, and the host of consultants concerned with environmental impact statements, and with marine insurance. It deals first with the chemical composition of petroleum hydrocarbon sources and their natural or accidental input into the sea. Then the chemical and biological methods on which design and methodology of oil pollution research is based are outlined. Petroleum introduced to the marine environment goes through a variety of physical, chemical and biological transformations during transport and these are discussed at length in a 100-page chapter on *Fates*. An even longer chapter deals with the effects on biological processes, on the marine food web, on the ecosystem and on human health, etc. The book ends with eight research recommendations and it stresses the well known difficulty of transfer of information from the laboratory to the prediction and evaluation of the potential impact on marine resources.

In this connection the six case studies recorded in the *Appendix* will stimulate research directed towards laboratory evaluation. Amongst these cases are two which hit the headlines in our national press in 1978 — the Amoco Cadiz spill which constituted the largest single spill originating from a tanker accident, and the underwater blowout, ITOX I, in the Gulf of Mexico which was the largest man-made oil spill in history when 0.5 M ton of oil was discharged burning for nine months into the ocean.

This report was commissioned by the US National Research Council and produced by some 100 specialists from all over the western world, mainly North American with a handful of Canadian, British, French, Israeli, Norwegian and Swedish participants. It constitutes the most authoritative up-to-date account on the effect of marine oil spillages. It does not enquire into their causes or into preventive measures to reduce their incidence.

Oil & Gas 1986

Financial Times International Year Book
Longman Group,
1985 23 pp. £54.00

This very useful annual production (since 1910) gives narrative, production and financial information on major oil and gas companies both up and downstream across mainly the western world and Japan. There are about twice as

many upstream companies than downstream which appears to the reviewer to be a grave distortion of the factual situation and it is hoped that editorial policy will rectify this situation in future and attract more entries from downstream contracting companies and also providing a geographical index of them.

A most valuable introduction to the 1986 scene by Chris Cragg the *Financial Times* energy economist starts the collection and new separate sections on oil brokers, and international associations are added. The collection ends with an advertising section on a supplier's directory and buyer's guide extending over 20 pages and covering mainly the western world only.

All entries of companies were inserted free of charge and little editorial control was exercised; therefore no responsibility is taken for omissions or incorrect insertions. Since the series has been going for a long time, very few are expected.

World directory of energy information

Gower Publishing.
Vol 1 *Western Europe*, 1981, 326 pp. £35.00
Vol 2 *Middle East, Africa and Asia/Pacific*, 1982, 418 pp. £35.00
Vol 3 *The Americas including the Caribbean*, 1984, 316 pp. £35.00

One can be rightly perplexed at the number of publications dealing with the 'world' of energy. The Institute publishes monthly *Energy World* dealing with Institute news and articles on issues in this energy sector including a uniquely useful digest of political, economic and commercial topics relevant to energy mainly British in origin. The Institute also publishes an annual year book entitled *Energy World Reference Book and Buyers' Guide*, giving information on the Institute, Energy products and supply figures relating to the UK and a buyers' guide of British firms.

These books are more world wide, as the titles suggest, but they omit treatment of the USSR and Eastern Block countries and no further volume is planned. For a similar but much more restricted treatment one has to go to the *World Energy Directory* (organizations only) published by Longmans and reviewed below, or publications originating from the World Energy Conference. Each of the volumes provides in Part I aggregation and comparative information on energy production, trade and consumption including a checklist on energy resource projects; Part II deals with individual countries giving key energy indications followed by market trends, supply industries and energy

trade; Part III deals with organizations and Part IV deals with publications, national and international.

The books are very well produced, there is evidence of excellent editorial direction and efforts of uniform treatment and the material is therefore invaluable for energy planners, producers of prime energy related equipment and consultants. In one volume a vast number of statistics errors come to light on use which will be rectified if and when the information is updated in a subsequent edition.* The cut-off date for volumes 1 and 2 appears to be 1979/80 and for volume 3 it is 81/82.

World energy directory

Longman Group. Second edition, 1985
582 pp. £120

This guide to energy R and D projects throughout the whole world is a considerably enlarged version of the 1981 edition. Apart from brief energy profiles on each country, it contains a survey of organizations involved in executing, financing or supporting R and D and demonstration work such as research institutes, government departments and corporations, industrial firms, learned and professional societies and institutes of higher education. It covers energy sources, renewable or non-renewable, and their present utilization, conversion technologies, modern combustion techniques (fluidized combustion), energy storage, handling equipment, energy policy, forecasting and system modelling. About 80 countries are covered from Trinidad and Tobago and the Soviet Union, dealt with in about one page each, to the USA dealt with in 60 pages and containing 385 entries.

The United Kingdom contains 425 entries which are preceded by a profile on coal, oil and gas uses, on energy efficiency programmes, the installation of energy saving equipment, and the financial incentives offered. One half of this survey deals with renewable sources and describes the work of the Energy Technology Support Unit at Harwell, specially emphasizing wind, solar and geothermal energy utilization, works in hand, and planned.

Whilst the majority of entries are useful and fit with the objectives of this compilation, there are several which do not and there are many omissions, eg the Department of Chemical Engineering at

* The trend in energy consumption appears to be given as the percentage difference in 1973 and 1979 consumption; this statistic is very misleading when it is compared with the graphical representation of annual consumption — see eg UK p 102

Cambridge where the pioneering work on fluidized combustion has or is being carried out; work on enhanced oil recovery in the UK is not only carried out at the University of Strathclyde.

It is a well-indexed reference book and will become even more valuable with stringent professional editing before the next edition is published.

Dr J C McVeigh reviews a selection of books on solar energy

Solar energy at high latitudes

Kerr MacGregor (Ed)
Ambient Press
91 pp. £28

This collection of papers was first published in two special issues of the *International Journal of Ambient Energy*, Volume 6, issues 3 and 4, 1985, and are bound as a collection for the convenience of readers for whom they have a special interest. In his introduction to the papers, Kerr MacGregor points out that there is still a popular belief that the reduction of available solar radiation with increasing latitude makes the possibility of solar space heating less viable. However, somewhat paradoxically, there is an increasing body of evidence to suggest that the longer heating season generally experienced at high latitudes allows a better utilization of available solar energy and that this can more than compensate for the lower levels of annual solar radiation. For example, those who are normally at home during the day — such as the very young or elderly — can benefit from the provision of a sheltered sunspace, or passively heated attached greenhouse. There is an interesting diversity of national solar heating philosophies displayed in the papers. Those from Finland and Sweden emphasize the active collector system with interseasonal heat storage, while the more maritime climates of Ireland, Scotland and Norway seem to attract the passive approach.

The first paper describes the first year of operation in the Kerava solar village in Finland. This is the largest single solar project in Finland and the total heating load comes from 44 flats with a floor area of 3756m². With a rock cavern hot water storage system and a heat pump included to meet high winter loads, the solar fraction (the percentage of the total heating demand met by solar energy) appears to be in the order of 40 to 50%.

Two Swedish interseasonal storage systems are described in the second paper. The first, at Lambohov, has been operating for over five years and the second, at Ingelstad, for two years less. Both systems performed well technically and have provided information which will enable long-term energy forecasts to be carried out.

Other papers from Sweden and Fin-

Encyclopedia of environmental science and engineering (second edition)

J R Pfaffin and Edward N Ziegler
**Edited by Gordon & Breach Science
Publishers, 1983**

Vol 1 493 pp. (A—E)

Although printed in Glasgow this is an American work and the title relates to US definitions. This encyclopedia is therefore about external environment, eg air pollution, rivers, lakes, biological issues, industrial waste, waste management, ecology, acid rain.

Environmental engineering, UK defined, ie heating, air conditioning, etc is not covered at all.

Volume 1 consists of 28 papers or articles each reviewing a particular topic and these have been arranged in alpha-

land covered an assessment of photovoltaic power systems for the grid and a national energy survey respectively. Two papers from Scotland and one from Norway concentrated on glazed spaces (passive solar), while the paper from Ireland described their entire renewable energy programme, which includes biomass and wind. Experience with a combined solar heat pump system from Denmark for heating a swimming pool showed a simple payback in the order of six years, while a somewhat futuristic paper from the UK envisaged an entire northern community sheltered from the elements within a single tent-like structure. The final paper came from the veteran United States authority on solar houses, William A Shurcliff, who described a new concept for a low-energy passive house, called the *thermal-lock*. The first demonstration house using this system, in Shrewsbury, Massachusetts, has been through two winters with 100% solar heating, no boiler or woodstove, and the living region holding within a few degrees of 21°C throughout the season.

This is a fascinating collection which will stimulate considerable interest, especially among those with interests in buildings and heating problems, and it can be thoroughly recommended.

Solar Energy in the European Community

The solar energy research and development programme of the Commission of the European Communities has been operating for over 10 years, with participants from laboratories and institutions in each member country. The results of this work are not only technically impressive, but demonstrate that people with different backgrounds and national loyalties can collaborate in a way which could usefully be adopted by other groups of countries. The three books examined in the following reviews cover different aspects of the CEC programme. The first,

betical order of title. There is a certain amount of cross reference in the form of additional titles directing the reader to an appropriate section and in volume 2 there is an index.

Included in volume 1 is *Energy Sources — Alternatives* by F W Mollenkamp and Kenneth C Hoffman. This is a 33 page review of technological ways in which the world energy demand can be met. The possibilities that are considered are mainly fossil fuel and nuclear with renewable being limited to about 10 pages. The review is strongly related to policy and environmental issues for each fuel. Some 57 references are given although none after 1980. This section is unusual in the number of references that are included.

These books will form a good starting point for the topics contained in them; however, describing them as an encyclopedia is a little exaggerated.

Dr A F C Sherratt

on solar collectors, is edited by Dr W B Gillett (formerly with the Solar Energy Unit at Cardiff University) and J E Moon of Cardiff University, under the overall guidance of Prof Brian Brinkworth, who has directed the Cardiff unit since it started work in the early 1970s. The second examines a European transition simulation model for thermal solar systems and is edited by Prof W L Durieux of the Katholieke Universiteit Leuven, Belgium. The third, and by far the largest with well over a thousand pages, is the Proceedings of the Sixth European Commission Photovoltaic Solar Energy Conference, held in London in April 1983, jointly edited by W Palz of the CEC and F C Treble of Farnborough, who is a long serving committee member of the UK section of the International Solar Energy Society. All three books are published by D Reidel Publishing Company, Dordrecht, Holland, for the CEC

Solar collectors: Test methods and design guidelines

Series A, Volume 6
W B Gillett and J E Moon (Eds)

The testing of solar collectors is one of several concerted actions within the research and development programme of the CEC. Approximately 20 laboratories participate in a collaborative group which has been developing solar collector test methods since 1975. Thermal performance test methods are studied by carrying out round robin tests on commercially available collectors and the results are then collated and published. All types of thermal collector have been examined, including flat plate liquid and air heating collectors, evacuated, concentrating and high temperature collectors. The 'long-life, low-cost, low-maintenance' philosophy is applied to this work and collectors are also monitored during long-term ageing outdoors for both durability and reliability. T

technical direction of the group is provided by the CEC Joint Research Centre in Ispra, where extensive indoor and outdoor test facilities have been established.

The book is divided into two major sections. The first covers collector test method recommendations and contains 13 short chapters. The first four deal with the theory, units, symbols and definitions. Then the book follows the logical order of mounting the collector, installation, instrumentation, performance analysis, optical performance, water and air heating thermal performance tests, tests using oil as the heat transfer fluid and durability and reliability test methods. The second section deals with guidelines for solar collector design and contains a wealth of practical detail, illustrated in some cases with photographs of disasters such as a degraded acrylic cover and a shattered glass cover caused by thermal stressing. There is a useful multi-language bibliography and five appendices, including design details for a solar simulator. A surprising omission for an otherwise very comprehensive text is the detailed index which normally accompanies any technical book. Perhaps CEC funds did not permit this.

A European transient simulation model for thermal solar systems

Series A, Volume 5

L Dutre (Ed)

European collaboration in the field of simulation models for active solar heating systems started a year after the collector testing programme, in 1976, when several groups started to exchange information at meetings sponsored by the CEC. This collaboration then developed into a formal programme through the European Modelling Group (EMG), with comparison of different national models and parameter sensi-

tivity analyses. It soon became evident that real progress could only be made when validation of the models was included in the programmes. Eight countries then agreed to build solar pilot test facilities, each consisting of a real solar system with collectors, storage, controls and associated pipework. The thermal distribution system in the building was replaced by a physical load simulator, capable of reproducing the actual thermal load of a typical house, with simulated occupants and weather conditions. In this early stage each country developed an individual system simulation programme, but this proved to be a barrier to collaboration. Prof Dutre then suggested that one particular programme, European Modelling Group Programme 1 (EMGP 1), should be adopted as the common model. This was later replaced by a more sophisticated modularly structured simulation model, EMGP 2, for the transient simulation of thermal solar systems. The general principles of EMGP 2 are described in the first chapter, followed by a summary of the mathematical algorithms and a chapter on the applied solar radiation data processing. The next three chapters present the physical models for each basic EMGP 2 component. A practical guide for users is given in chapters 7 and 9, with a series of selected examples in chapter 8. Details of how and where to gain access to the programme are given in the introduction. The book contains a very detailed list of contents, but an index has been omitted.

Sixth EC photovoltaic solar energy conference

Proceedings of the international conference held in London, UK, April 15-19, 1985.

W Palz and F C Treble (Eds)

These proceedings are the official record of the papers presented at the *Sixth European photovoltaic conference* and they cover all aspects of photovoltaic

technology. The conference was attended by about 500 delegates representing both academic research and a wide spectrum of industrial organizations dealing with system technology, applications, marketing and procurement. Following the pattern which now seems to be widely adopted in major international conferences, there were some 60 papers presented orally in main sessions and over twice as many, some 146, presented and discussed on an individual basis in poster sessions.

The proceedings can be grouped into eight sections corresponding to the general themes of the conference. The first section was largely devoted to a series of overviews — the position in the European Community, by Dr Palz and W Kaut, a world overview, by Dr P Maycock of the United States and several papers looking at the market, finance and related problems of reducing the costs of materials. This was followed by sections on fundamental studies, advanced concepts and devices, system technology, applications and field experience, amorphous silicon, polycrystalline thin-film cells and crystalline silicone. A list of participants was included, but no index (is this a CEC house style?)

Note

By using the camera-ready text system for all three books, the publishers have been able to get the information out within a year of the final text preparation. The slight limitations of this method should not deter the serious library from purchasing them and they will be invaluable for the specialist research groups active in the field. The photovoltaic conference proceedings are particularly recommended for their insight to a rapidly developing technology with expanding world markets.



Forthcoming Institute of Energy conference in conjunction with the Yorkshire branch with the Institute of Hospital Engineers and the Institution of Plant Engineers in association (others to be confirmed)

The effectiveness of fuel additives — 2

to be held at AHED House
Ossett, Yorkshire

19 November 1986

see 'call for papers' in this issue

Energy Efficiency GEM Awards

Peter Walker, Secretary of State for Energy, thanked British Gas for its contribution to his energy efficiency campaign. Mr Walker, who was presenting the 10th anniversary Gas Energy Management (GEM) awards in London said: 'I congratulate British Gas on the record breaking success of the awards, which have done much over the years to promote energy efficiency. I also thank British Gas for putting its weight behind my Energy Efficiency Year campaign.'

British Gas helped today's winners get more for their money.

Ideal Standard, the industrial winner, cut the fuel cost element of their manufacturing overheads by 57%. They moved themselves up from the bottom to the top of their company's worldwide energy efficiency league.

Newcastle City Council, the commercial and public service winner has a long and impressive record of energy efficiency initiatives and they are still looking for further improvement. If all local authorities matched Newcastle's performance, we could save at least £100 M in that sector.'

Source: *The Plant Engineer*

Industry Year Supporting local initiatives

John Webber, who heads the North West Industry Year Education Group, says that it is giving priority to supporting the many local initiatives stemming from existing education/industry links and those planned by education authorities. Mr Webber is Regional Organizer for the CBI's Understanding British Industry programme.

The Group includes Industry Year coordinators from each of the 17 local authorities, Science and Technology Regional Organization representatives, and members from colleges, polytechnics and universities.

Events already planned include:

- Salford Education Authority has set a target to send 50 teachers from 20 secondary schools to gain 'hands on' experience with industrial or commercial firms
- Wigan Education Authority has a programme of work experience for pupils and staff and is arranging Industry Weeks at a number of schools, linking them with local companies
- Stockport Education Authority is arranging a 'Design and Make' competition which will involve pupils in projects relating to an understanding of local industry and enterprise

In addition, many institutions are co-

operating to provide conferences and seminars. The Association for Science Education, for instance, is to hold a conference at which examples will be given of how schools have worked with local companies and how pupils have been made more aware that what they do in schools has a direct bearing on the world of work.

Source: *Industry Year News*

Energy from waste Gas gets turned off

Timber waste has replaced gas as the heating fuel at the Rempoy Swansea factory and, as well as saving the cost of 50 000 therms of gas a year, this has eliminated the high cost of waste removal from the site, reports *Energy Management*.

The factory was built eight years ago and originally waste from the extraction system was discharged into containers occupying most of the ground floor of the filter-house building.

The 60 000 ft² factory was heated by medium pressure hot water generated by gas-fired boilers and circulated through a radiant heating system to ensure ideal comfort conditions throughout the production area. The water was also used to generate the hot air (70°C) required in the drying section of the automatic paint plant.

Production changes which considerably increased the volume of waste coinciding with rising costs of waste removal, prompted the factory manager, Peter Nichols, to look at methods of using the waste to generate energy. His aim was to find reliable equipment which would be compatible with the existing boiler plant, enabling it to burn the waste, and so provide the required heating at virtually no cost.

The scheme chosen eliminated the need to build a new boiler house and an external silo, using the ground floor of the filter-house building for both requirements.

To store the waste a horizontal silo was constructed from cement blocks and incorporated in it was a totally new design of silo discharger. This has an infinitely variable operating speed so that it can readily meet any boiler load.

Material from the silo discharge screw goes into a pneumatic feed system incorporating non-return valves to prevent any possibility of flash back into the silo. Finally, the fuel is discharged off a spreader plate onto the water-cooled plain grate of the three-pass economic boiler with an output of 1 MW.

Two-stage combustion maximizes utilization of the available energy and coupling the boiler's flow and return to the existing heating system eliminates need for a second fuel burner. An air-cooled dissipator, incorporated for summer operation, ensures that any

excess waste material can be burnt eliminating removal costs which would be incurred otherwise.

Source: *Energy Management*

Nuclear waste £200 M site planned

A land-based nuclear waste site for low level and intermediate-level radioactive waste would cost more than £200 M to build, the Cabinet was told.

The Times reported that the site could be ready between 1992 and 1995. It would be used for 50 years and kept secure for another 300 years to allow the most active materials to decay to a safe level.

Those specifications were contained in a submission to the Cabinet for permission to conduct preliminary geological surveys in four places.

The request was made by the Department of the Environment on behalf of the Nuclear Industry Radioactive Waste Executive, Nirex.

Opponents, such as Friends of the Earth and the Town and Country Planning Association, expect an attempt to bypass part of the planning process.

Nirex said, in February, that the surveys would take between six to 12 months, and that a public inquiry would be held.

The sites include old clay working near Elstow, Bedfordshire; a former Ministry of Defence base near Arncott, Oxfordshire; a section of the Atomic Energy Research Establishment grounds at Harwell; and land at an old power station at Killingholme, Humberside.

Source: *The Times*

OECD/IEA report 'Encouraging' growth in nuclear power

The prospects for nuclear energy in the advanced industrialized countries of the OECD up to the turn of the century and beyond are 'encouraging', in spite of likely sluggish growth in energy demand and problems with the public's acceptance of nuclear power, the OECD claims.

The OECD's Nuclear Energy Agency and the International Energy Agency say that the production of nuclear electricity is likely to double by the year 2000 in the OECD area. Over 26% of the OECD's electricity will then be nuclear.

This growth in supply will partly stem from higher operating efficiencies in stations now working, and partly from new stations planned or being built.

Four OECD countries now make more than a third of their electricity from nuclear energy, but by the year 2000 seven of them expect to do so.

Moderate growth rates are expected

continue beyond the turn of the century. A growth in nuclear power of between one and a half and three times is expected in the first 25 years of the next century. Too low a rate of growth could lead to a switch back to dependence on oil. This would hit economic growth.

Problems on the safe operation of nuclear stations have largely been solved, says the OECD. Some improvements could be made by:

- simplifying and standardizing designs
- utilizing fuel better
- developing even more economical fuel cycle technologies
- streamlining operating procedures
- cutting down construction times.

The safe disposal of nuclear waste — the single biggest public concern about nuclear power — can best be resolved through closer co-operation among OECD countries.

Source: *British Nuclear Forum Bulletin*

Pinch Technology A British breakthrough

A new British energy-saving technology that also reduces capital costs has been developed by a professor at UMIST. Conventional wisdom states that cutting fuel bills involves extra investment. Prof Bodo Linnhoff is defying the rule with his *pinch technology*. In fully documented case studies worldwide the technology has brought down the capital requirements by as much as 25% as against current designs, in addition to energy savings of 15–90%.

Speaking at a London and Home Counties branch meeting at the Royal Institution, Prof Linnhoff said, 'It doesn't matter how far the price of oil falls pinch technology still makes business sense. Up until now it's been convenient to define its analytical power in terms of energy-efficiency, because fuel prices have been high. But it is just as valid to concentrate on capital savings or improved process flexibility. In all three cases pinch technology is having an impact on company balance sheets and competitiveness.'

'The worry is the lack of take-up in the UK. As often before a British breakthrough, discovered and developed here, is being exploited abroad while British firms agonize over its implications. Perhaps the prospect of substantial capital savings may overturn their traditional caution in time for them to benefit from pinch technology in the next major investment round, that seems imminent.'

'There are many instances of companies achieving depressingly poor results, even though they have taken great trouble to acquire the best equipment available. Process performance depends on the optimal integration of these elements within the overall set up. This was an impossibly complex task before pinch technology provided the understanding of process dynamics.'

'With the benefits of this insight it's hardly surprising that the pre-pinch

solutions were wasteful and restrictive. What isn't surprising either (though it ought to be) is how many British companies are persisting with the old designs despite their obsolescence. Far from saving twice, they're paying twice: both at the initial construction stage and subsequently through higher running costs.*

Commenting, Lewis Tozer (chairman of the Institute of Energy's London and Home Counties branch) said: 'In today's struggle to gain market shares, time-worn methods must give way to new ideas. Energy is the unavoidable input to the processes of production. Pinch technology will help to ensure that industry uses energy efficiently and profitably.'

Pinch technology is the science of energy recovery. It is based on the discovery by Prof Linnhoff of a new principle of thermo-dynamics, the pinch principle, for which he received the Royal Society's Gold Medal in 1981. It defines the crucial constraining *pinch point* of any recovery network; from this can be calculated the minimum heating and cooling requirements of an industrial plant (or service establishment for that matter, such as a hospital, where opportunities exist for significant heat recovery). Not only does pinch technology pinpoint the most energy-efficient process arrangement but it ensures that capital requirements are minimized, because the design itself is the simplest and most cost-effective possible, within the individual company's operating constraints.

Source: *Linnhoff March*

Battelle Heat pump simulator

Software capable of simulating the operation of a heat pump driven by a gas engine is being developed by researchers at Battelle (Columbia) in a project for the Gas Research Institute (GRI).

The software will be used as a tool for evaluating the efficiency of a heat pump operating with optimized components — such as compressors, pumps, and fans when driven by five different engine systems that the GRI is developing.

According to Frank Jakob, who heads the study team, gas-engine-driven heat pumps could potentially be operated at costs competitive with a high-efficiency gas furnace-central air conditioner system combination or with electric heat pumps.

'First, they are intrinsically capable of following the needed heating or cooling load,' Jakob says. 'In addition, they can use available waste heat from the engine to boost heating performance and to defrost evaporator coils.'

Because of the potential of these systems, the GRI is funding five projects intended to lead to the commercialization of residential and light commercial gas-engine heat pumps.

The engine systems being evaluated in the five GRI projects are: the gas-fired kinematic Stirling engine, the free-piston Stirling engine, the internal combustion

reciprocating four-stroke piston engine, and two types of rotary engines.

In the study researchers are analysing general system requirements for gas-engine-driven heat pumps, such as heating and cooling performance, seasonal performance factors, noise and vibration control, engine emissions, safety considerations, maintenance requirements, reliability, and trade-offs between cost, performance, and reliability.

They also are studying the components of each of the five engine systems, based on the configurations that provide optimal performance with each engine.

Source: *Battelle*

Czechoslovakia Increased number of heat pumps

Heat pumps making use of low temperature heat in the air, water and soil will be introduced more widely in Czechoslovakia in the next five-year period.

After 1990, the national income is to rise by 3.5% annually but primary energy resources available for consumption will not increase beyond 0.7% a year. One of the ways to the relative saving of 14 M of black coal units is to be wider use of the low-temperature heat of soil and water.

Czechoslovakia has recently launched its own production of heat pumps which were earlier imported. Besides their economic advantages, also their importance for environmental protection is appreciated as they can substitute coal burning equipment.

Altogether 24 heat pumps with the total output of 1520 kWh are currently in operation in Czechoslovak enterprises.

The largest has been working reliably at the Dylen pit of the uranium mines in West Bohemia exploiting the heat of mine water. Thanks to this the enterprise could drop plans to build a coal-burning heating plant.

Source: *Czechoslovak News*

Spearhead consortium for energy efficiency in Wales

A consortium has been set up with the aim to reduce the cost of energy efficiency improvements for companies in Wales.

The consortium has adopted the name *Spearhead* to highlight the way that inefficient hot water storage systems and steam raising boilers waste huge amounts of money for Cardiff businesses. It is offering free surveys and advice to any company that wants to see how much money it could save by switching to modern equipment.

The move has been welcomed by Cardiff Energy Action. A spokesman

*It is hoped that the full text of Prof Linnhoff's lecture will be published in *Energy World*.

said: 'The water and space heating costs that were normal 10 years ago are still accepted as normal by many factory and commercial property owners. Recent improvements to system design, automatic controls and plant efficiency mean that modern equipment can save literally thousands of pounds a year.'

'We welcome the initiative that the companies have shown in forming a consortium and hope that every company using hot water or steam will at least take advantage of their free survey service.'

The Spearhead consortium enables local businesses to benefit from co-operation between three suppliers offering individual expertise, and ensures that all aspects of the design and installation are co-ordinated in order to achieve the maximum efficiency and minimum inconvenience.

Source: *Cardiff Energy Action*

Harwell LTHU programme

The Low Temperature Heat Utilization Programme (LTHU) was set up by the Energy Efficiency Office of the Department of Energy in order to investigate ideas for new equipment aimed at making further significant improvements in energy efficiency.

The programme has been underway since 1984 and its main objective is to identify a product which will be attractive to both user and manufacturer. This involves much assessment work which in turn requires time, money, technical experience, market knowledge and an impartial approach. Interaction between users, manufacturers and research organizations is absolutely vital for the programme to be effective.

Work has already begun in assessing potential ideas, and these could loosely be classified as heat recovery, heat transportation, energy conversion and energy storage. A general requirement is that the potential UK energy saving from each idea should be greater than the equivalent of 50 000 t of coal per year, after a reasonable market penetration. However, there are no restrictions on the areas of application for new ideas. Further information from: Steven Moss, technical manager, LTHU, Building 351.29, Harwell Laboratory, Oxon OX11 0RA (tel 0235 833954).

Source: *Energy Newsletter (CIBSE, RIBA, RICS)*

UKAEA/CEGB A new highspeed air gun

A concrete abutment 11 m x 8 m x 5 m has been built at the UKAEA Winfrith Research Establishment. It will be the target for a giant air gun which can fire projectiles weighing up to 1.6 t at speeds reaching 100 mph.

Research over several years in Britain and other countries has simulated the effect of impacts using computer models.

This has included the effect of pieces of plant or small aircraft hitting power stations and components.

The gun is the central feature of a new horizontal impact rig, which will be used by the Atomic Energy Authority and the CEGB in experiments on the effect of projectiles of different shapes and sizes hitting steel or concrete at high velocities. A smaller air gun has been used at Winfrith for high velocity work since 1979 and for lower velocities other experimental rigs are used at the CEGB's Structural Test Centre, Cheddar. The new rig will extend the test capability of the plant programme of research into the safety of nuclear power stations and associated facilities, as well as the integrity of a range of containers used in the transport of radioactive materials.

Compressed air will be used in the gun to accelerate models weighing up to 1.6 t along a barrel 2 m in diameter and 10 m long, with impact velocities of up to 45 m/s (100 mph). Smaller diameter barrels will be fitted for use with smaller models, which may be accelerated to velocities of 250 m/s (560 mph). The target, inside a containment building to protect the operations plant from damage by ricochets, will be supported against the massive steel-faced concrete abutment.

Source: *UKAEA*

Japan Carbon monoxide adsorbent

A carbon monoxide gas adsorbent capable of adsorbing and separating carbon monoxide gas from LD converter gases in a one-stage pressure swing adsorption (PSA) process has been developed in Japan.*

The new process, based on the adsorbent, can recover carbon monoxide gas of 90% or greater purity and greatly reduce the recovery cost as compared with the two-stage PSA process or the conventional process which uses absorbing liquids.

Converter gases are made up chiefly (about 70%) of carbon monoxide gas and include carbon dioxide and nitrogen gases. To recover carbon monoxide gas, it must be separated from the other gases.

In the existing two-stage process, carbon dioxide is adsorbed and separated from converter gases in the first stage. In the second stage, carbon monoxide gas is adsorbed and separated from nitrogen gas. Then by reducing pressure, the adsorbed carbon monoxide is desorbed from the adsorbent and recovered as carbon monoxide gas products.

The adsorbent features high performance with special chemical treatment so as to adsorb carbon monoxide gas efficiently.

If gas temperature and pressure are optimally adjusted, carbon monoxide gas of 98% or greater purity can be recovered in a one-stage PSA process, although there may be some difference,

depending on the components of converter gases. The carbon monoxide gas recovery cost can be largely reduced as a result of greater economy in operation and equipment costs.

The adsorbent can be used to recover carbon monoxide gas not only from LD converter but also other gases. The much expectation is placed on the quantity recovery by the new process carbon monoxide gas for use as raw material for C₁ chemistry.

At the Fukuyama Works, field tests are now under way on the service life of the new adsorbent using gases discharged from LD converters. Following confirmation of the test results, NKK plans to put the adsorbent to practical use.

Source: *SEASIS Newsletter*

India Award winning invention

The Indian Institute of Petroleum (IIP) Dehra Dun, has developed a low pressure (LAP) type film burner suitable for operation with heavier grade fuel oil. The burner has been commercialized after thorough field trials. The prototype models have established fuel savings of up to 25% over the existing designs of LAP burners.

The burner is based entirely on a new concept which enables it to utilize the energy content of atomizing air more effectively than in the case of conventional LAP burners. Problems like corrosion due to sulphur content of fuel, choking of fuel passage, choking of burner block and dripping of fuel oil from the nozzle tip are completely absent, resulting in lower maintenance cost, lesser number of breakdowns and higher production. A patent for the design has already been filed.

The film burner can be installed in place of the existing LAP burners without replacing the accessories. The burner can be operated with hv grade fuel oil with 5-10% excess air and 1:1 turndown ratio, while the conventional LAP burners require 50-100% excess air and have a 1:2 turndown ratio. Because of these differences between the IIP burner and the conventional ones, considerable fuel savings are possible in the case of the former. Also, because of its suitability to operate with fuel oil at lower temperatures, the IIP burner can work with preheated combustion air which has been heated with exhaust gases at higher temperature, thereby raising the overall efficiency of the system. The burner is recommended for use in furnaces for glass and ceramic billet heating, heat treatment, ladle heating, galvanizing, and melting of aluminium and other nonferrous metals.

The IIP burner won the National Research Development Corporation of India's 1985 Independence Day award.

Source: *CSIR News*

*Developed by NKK

Energy efficiency 1986

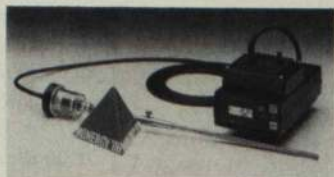
New gas engine

contribution to *Monergy '86* is the introduction by **DAF Diesel** of the energy efficient gas engine - the K1160. The engine is the result of five years' research and development and is based on the company's K1160 naturally aspirated diesel engine.

The unit has specially designed pistons, valves and cylinder head, water-cooled exhaust manifold, and contactless electronic ignition. Spark plugs are located internally within the Heron combustion chamber. The maximum power output is 150 kW at 220 rpm (DIN).

The energy efficient unit burns gas to drive an electrical generator, whilst heat losses through exhaust, coolant and radiation are recovered. It is claimed that a total energy recovery of 85 to 90% can be realized.

Reader enquiry no 4/1



The Optifuel continuously measures and digitally displays stack oxygen/carbon monoxide levels

Optimum combustion efficiency

Neotronics have introduced their new Optifuel to coincide with the *Monergy '86* campaign. The Optifuel enables fuel savings to be achieved with a minimum of investment. Oxygen and carbon monoxide are simultaneously and continuously monitored and digitally displayed. At just under £500, payback is fast and savings can be immediate. The Optifuel is suitable for use on all domestic, commercial and industrial boilers.

Reader enquiry no 4/2

Gas-fired boilers

Wokvis will be featuring their coniflame gas-fired commercial boilers on the company's stand at *Levac '86* in May.

These high-efficiency boilers provide outputs from 104 to 1066 kW. An advantage is secondary air modulation: as the heat input to the main boiler is reduced, secondary air introduction is simultaneously reduced, maintaining the flue losses as a constant for all output. The Econoflame's boiler efficiency of nearly 83% is therefore considerably more economical than that of most boilers of a similar rating.

Reader enquiry no 4/3

New fluidized bed combustion test facility

Abcock Worsley have built a new combustion test facility which will be used to further both the development of the company's fluidized bed product range and to provide a service to those industrial organizations wishing to test the suitability of potential solid fuels for fluidized bed combustion.

Operated under the supervision of a senior R & D engineer the facility comprises: the furnace tested at 1 MW, connected to a high-efficiency gas cleaning plant via a long refractory-lined duct; sampling points enable the combustion process to be studied in detail, the flexibility of the control system permitting the efficiency of any fuel to be optimized. As part of the service, a comprehensive report is supplied outlining the commercial viability of the energy source and its suitability for fluidized bed combustion.

Reader enquiry no 4/4

Four new Potterton boilers

Potterton Commercial Division launched four new energy saving boilers in February. The range consists of two high efficiency and two condensing boilers: the *Derwent HE*, the *Condensing Derwent*, the *Diplomat HE* and the *Condensing Diplomat*.

The *Derwent HE* series boilers

feature an increased heating surface, improved insulation and a low level draught diverter. The use of fans is avoided. These features are shared by the *Diplomat HE* series, and it is claimed that both ranges result in a wide choice of boilers with a gross efficiency level 2.5% to 4.5% better than in previous designs. The *Derwent HE* series ranges from 65 to 325 kW and the *Diplomat HE* series from 43 to 93 kW.

Potterton Commercial Division have introduced their two new *Condensing* series after many years of the proven value of this method, mainly in Europe. All heating boilers can, if the design permits, operate for much of their annual running time with return temperatures below 55°C. The *Condensing* design takes advantage of this and gives 86.4% gross efficiency with a return of 60°C improving to 91.0% at 40°C. This represents a minimum gain of between 8.4% and 15% as compared with conventional boilers.

Reader enquiry no 4/5

Gas-fired air heating equipment/gas-fired storage water heaters

Johnson & Starley offer a new range of *gas warm air heaters for domestic central heating*. Outputs vary from 5.6 to 7.3 kW to 15.8 to 18.8 kW. Features supplied as standard fitting or optional extras include: warm air modulation control; combined heating and controlled ventilation; water heating; and time control. The company also supply *gas warm air heaters with upflow air delivery for commercial, industrial and large domestic applications*. Outputs range from 24 kW to 48 kW.

For applications that require large quantities of hot water quickly, **Johnson & Starley** have introduced the *Janstor* gas-fired storage water heater manufactured by **A O Smith**. Features include: an automatic flue damper; good insulation; a high-quality glass-lined steel tank; integral time control; and automatic frost protection so that it is

not necessary to leave heaters running in very cold weather. It is claimed that savings achieved from damper and clock fittings show reductions in running costs from £80 to £160 pa.

Johnson & Starley also supply an additional service of *upgrading to modern standards* gas-fired warm air heating systems installed in the sixties and seventies. The company offers an advisory service and a range of equipment for upgrading systems.

Reader enquiry no 4/6

New 1000 kW generating set

The first 1000 kW generating set to feature the new **Cummins KTTA-50G** diesel engine has been introduced by **Petbow**. This is the first 'mass produced' 1000 kW industrial engine to compete favourably in size, weight and price with previous competitive heavy industrial engines.

The new set is rated at 1009 kW, 1262 kVA at 50 Hz with a prime continuous duty rating and meets BS 5514, DIN 6271 and ABGSM A specifications. At 60 Hz operation, the set is continuously rated at 1109 kW, 1386 kVA. The **KTTA-50G** engine is a Vee-16 series turbocharged after-cooled diesel featuring four turbochargers arranged to ensure a high- and low-pressure unit for each cylinder bank.

Reader enquiry no 4/7

Centrifugal multistage boiler feed pumps

The **Weir FK** range of barrel casing multistage cartridge pumps incorporates a full cartridge pull-out feature which allows the pump internals, complete with mechanical seals, bearing housings and pump half coupling to be withdrawn from the pump casing very quickly without disturbing pump alignment or pipework.

The range is particularly suitable for boiler feed duties in generating stations with rated outputs between 200 and 660 MW.

Reader enquiry no 4/8

Process control instrumentation

A novel liquid crystal temperature switch is being introduced by **Delta Controls**. The heart of the new temperature switch is a liquid crystal that undergoes a transition from optically opaque to a clear

state at a predetermined temperature. The crystal is contained in a small cell at the end of a probe, which is coupled directly to input and output optical fibres.

A fibre optic cable is used to interface the probe with a remotely located electro-optic relay, which transmits coded light signals to the liquid crystal and provides a relay output depending on the switch state. The switch can be provided with set points in the -50 to +200°C range, and the switching differential can be as small as ±0.5°C.

Besides meeting the need for a safe, reliable interference-free sensor for use in hazardous areas, the new temperature switch is also expected to find many applications in the gas, dairy, brewing and other food-related industries, wherever accurate control must be exercised at specific well-defined temperatures.

Reader enquiry no 4/9

Carbon sensor

The model **Z-CS1/Z-CS2** carbon sensor is manufactured by **Kent Industrial Measurements**, a **Brown Boveri Kent** company.

The sensor is mounted directly into the furnace and gives an instantaneous read out of changes in gas conditions at the process temperature and in the immediate vicinity of the work load, thus enabling accurate control to be achieved. The carbon sensor has been particularly successful in the USA. This is a result of its special construction, using a 'ceramic' outer electrode material, which can withstand the extremely harsh conditions existing in carburizing and carbonitriding atmospheres. The Kent sensors have enabled specialist heat treatment companies, where the cleanliness of the work load can be far from ideal, to operate, for continuous periods of 12 months or more.

Reader enquiry no 4/10

Trade publication

Oxygen analysers. **Servomex** give details of their analysers and controllers in a new catalogue. In addition to basic analysers **Servomex** can supply complete analyser systems. The analysers are widely used throughout industry in applications as diverse as food packaging and petrochemicals.

Reader enquiry no 4/11

ENERGY WORLD — COMMERCIAL

(Photocopy acceptable)

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

4/1 4/2 4/3 4/4 4/5 4/6 4/7 4/8 4/9 4/10 4/11

Name

Address

Organization

The president-elect: Professor J Swithenbank FEng

Professor Joshua Swithenbank FEng, known to everyone as Jim, was born in 1931 and brought up in the Yorkshire Dales. He was educated at a Quaker school in Wigton, Cumberland. His early interest in energy matters was stimulated by the dramatic developments occurring in the nuclear field at that time and led him to take his first degree in physics (hons) at Birmingham University (1953). A related interest in propulsion systems led to his first job as a research and development engineer at Bristol Aero-engines (which later became the Bristol Engine Division of Rolls-Royce). His work was concerned with the design and flight testing of the ramjet engine which later powered the Bloodhound anti-aircraft missile. The optimization of this and other combustion systems presented a challenge which has continued to fascinate him to this day. During his work in Bristol, Jim was among the first to utilize digital computers to help solve major engineering problems and it was here that he met his wife who was also working on the computer.

In 1958 they emigrated to Montreal, Canada where they worked as aircraft design engineers concerned with problems such as air-conditioning systems and the installation of aero-engines in aircraft. Jim next moved to McGill University to work on 'any topic that he wished'. This was an invitation that could not be refused! He then independently invented the Scramjet engine and was soon engaged in research into hypersonics and supersonic combustion, leading a team of 15 workers. Although this work was somewhat ahead of its time, the recent American Star-Wars initiative could well lead to the use of air-breathing Scramjet engines to make a dramatic increase in the percent payload carried into orbit by vehicles similar to the space shuttle. Jim's post at McGill was associate professor of Mechanical Engineering and must have given him a taste for university work as he has worked in academia ever since.

In 1961 Jim and Margaret decided to return to the United Kingdom. For an academic with broad interests in combustion and energy, the Department

of Chemical Engineering and Fuel Technology at Sheffield University with its long-standing international reputation, was an obvious choice. At Sheffield, Jim obtained his PhD and was given a personal Chair, in 1975. In 1981 he took over as head of the Department.

The first research task undertaken at Sheffield was concerned with the problem of unstable combustion which was plaguing solid propellant rockets at that time. His prediction and subsequent confirmation that transonic vortices within the rocket, driven by non-linear effects of the combustion oscillations, caused many of the problems was an important breakthrough. In 1962 work was started at Sheffield on supersonic combustion engines with test facilities producing air at 6000 K for flight up to Mach 16. It was clearly impossible to carry out such work in Sheffield and the Department's 30 hectare laboratory near Buxton has been developed as an important University research station for such large, noisy, hazardous research. Other facilities which have been built at this laboratory include a very large fire research wind tunnel for the study of phenomena such as pool fires in a cross-wind.

Over the last 25 years, other research projects which Jim has carried out or supervised include: gas turbine combustors, industrial furnaces, rotating fluidized beds, two-phase flow, droplets and sprays, internal combustion engines, digital control of boilers, regenerators, power fluidics, cyclone design, combined heat and power, etc. In the course of these investigations, several electro-optical instruments have been invented and developed; in some cases to commercial exploitation. These studies have formed the basis of more than 60 PhD and MSc theses, many patents, several films and video-tapes, and more than 100 scientific and technical publications.

Combustion is now at an exciting stage of development since the governing equations are well established and methods of evaluating them by digital computer packages are to the point where they can be used by all types of engineers rather than by computer specialists only.



Professor J Swithenbank FEng

The team of mathematical modelers within his group at Sheffield are contributing to this important new area of energy engineering.

Consulting work which he has carried out for many companies and agencies both at home and abroad, ensure that his academic work retains a correct balance with industrial needs.

These wide interests in energy matters have resulted in his serving on many committees including: the Council of the Accreditation Committee of the Institute of Energy since 1981; the Working Committee on Energy as the Institute representative for many years; the International Committee on Air Breathing Engines as a founder member; the International Flame Research Foundation; the Combustion Institute (British Section); various committees of the SERC, chairman of the Combustion Physics group of the Institute of Physics etc.

In the course of his work, Jim has travelled widely in Europe, the Middle East, the Far East, and North and South America. This has allowed him to take advantage of his interests in photography, sub-aqua diving, and archaeology.

Last but not least it is appropriate to record that he is a Fellow of both the Institute of Energy, and the Institution of Chemical Engineers, a Member of the American Institute of Chemical Engineers, a Fellow of the Royal Society of Arts, and a Fellow of Engineering.

Personal

K W Dale (Fellow) senior partner at consulting engineers Dale and Goldfinger, has been unanimously elected as an Honorary Fellow of CIBSE by the council of the institution.

Dr Ivan Dunstan has been appointed director general of the British Standards Institution from 1 June

1986. Dr Dunstan has been standards director of BSI since 1983, responsible for the national and international standards programme which has achieved record output in 1986. There are now nearly 10 000 published British Standards, with 9000 projects in the pipeline. Over 70% of this work is international and the United

Kingdom is the world leader among industrialized countries in alignment with international standards with international ones, to the benefit of British trading interests.

Dr-Ing Peter Gerber became on January 1986 director of the Verein Deutscher Ingenieure.

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.

Course No 9-351

Title: Laser optical and spectroscopic diagnostics in combustion.
Duration: 5 days.
Location: Imperial College, London.
Starting: 23 June 1986.
Content: Optical emission, absorption and laser spectroscopy, including Raman, CARS and fluorescence, optical

Course No 9-351 (continued)

Content: measurements on phase objects by interferometry, shadow, schlieren and deflection mapping methods, holography, Doppler velocimetry (with particular attention to signal processing), particle sizing and velocity measurement by light scattering.

Obituary

Ken Barker (Fellow) chairman of the Yorkshire branch of the Institute for the year 1983-84, died suddenly when visiting a client on 27 January 1986.

Ken served his apprenticeship with International Combustion, Derby, during which time he gained an external London degree in engineering, later becoming a test and commissioning engineer for ICL. In 1951 he joined BCURA as a section leader in the Boiler Availability Department, then under the leadership of Dr Gordon Whittingham. He left BCURA in 1954 to become a senior engineer with NIFES in London. From 1958 to 1968 Ken was chief combustion engineer with Charrington Hargreaves, London and Manchester after which, in 1968 he joined Norstel, Templewood, Hawksley of Slough, specializing in the thermal treatment of sewage sludge on a worldwide basis. In 1972 Ken entered the consultancy profession becoming an associate in John H Haiste and Partners, Leeds.

From 1975 until his untimely death Ken was a director of White Young & Prentice Royle, consulting engineers, Leeds, where his clients included the Department of Energy and Industry, ETSU, the Northern Regional Health Authority, Total Oil Great Britain, and J O Buchanan. He was currently chairman of the Pennine Energy Managers Group. He was also a Fellow of the Institute of Petroleum.

Ken was a family man, recently becoming a grandfather, his two daughters providing him with grandchildren within a short period of one another; his social activities included Round Table and he was a warden of his local church at Follifoot. To his wife, Jean, and her family we extend our deepest sympathy in her loss; this we share — the Institute has lost an active Fellow, who was a delightful companion at any time.

David Gunn (Senior Fellow)

Dr George Coles (Senior Fellow) died on 7 February 1986. Dr Coles was born in Birmingham and educated at that University. He was awarded his Doctorate for research under the late Ivon Graham on the oxidation of coal and spontaneous combustion. He

joined the newly formed Physical and Chemical Survey of the National Coal Reserves under the Department of Scientific and Industrial Research in 1928 at the West Midlands laboratory. He was promoted in 1931 to deputy chief coal survey officer in the Nottingham Laboratory. From that time his whole working life was in the East Midlands coalfield. He immediately took an active interest in the work of the local branch of the Institute serving as a committee member, chairman and treasurer. For this service he received the Special Award of the Institute, and was elected to honorary vice chairman of the East Midlands branch.

He was a meticulous and careful scientist and contributed to the high standard of analytical work which was the hallmark of the Coal Survey.

In 1953 he joined the expanding Scientific Control service of the National Coal Board as the deputy divisional chief scientist, a post which he held with distinction until the re-organization of the Board in 1966 when he retired. He was universally liked and respected and contributed his vast experience and critical approach to numerous papers. I worked closely with him for half his working life and I cannot recall any serious disagreement or harsh words with any member of the staff.

In later years his physical health deteriorated, and he died peacefully after a few weeks in a Nottingham Nursing Home in his 85th year. He is survived by his wife, Daisy.

N M Potter

(Past president and Senior Fellow)

Ken Lowe (Fellow) who died in February 1986 joined the Institute in July 1961.

He represented Clyde Fuel Systems in the south-west for many years; and other energy equipment manufacturers before and after a period with Devon County Council.

He was especially mindful of the difficulties of arranging viable technical meetings in the area and to this end formed the South West Heating Association — a harmonious group of engineers of several disciplines, manufacturers' agents, academics and others sharing the common objective

of more effective energy use. He was president of the Association.

Gordon Payne
(Fellow)

Arthur Strong (Fellow) died in hospital after a short illness on 7 February 1986 aged 57. He served the Institute of Energy's North-Eastern branch as a very efficient, keen and conscientious honorary secretary for 12 years and was branch chairman in 1977-78.

Educated in Wakefield, he served for short periods as a laboratory assistant at Leeds University and in the Palestine Police Force before joining the Scientific Service of the National Coal Board in Durham in 1948. He held positions in Areas 5 and 6, and moved to the Divisional Laboratory in 1957. During this period he pursued his studies at Rutherford College, Newcastle upon Tyne obtaining his Higher National Certificate and the Licentiate of the Institute of Chemistry, and passing the Institute of Fuel examination to become an Associate Member (subsequently Member). Later he obtained a London external degree and the Licentiate of the Institute of Ceramics.

In 1959 Arthur transferred to Marketing Department, NCB and became head of Technical Services in 1970; he held this position in the North-East Regional Marketing Department at the time of his death. In addition to his work for the Institute of Energy, he became a Justice of the Peace and was active in his church work at the Rowlands Gill Methodist Chapel.

Arthur had a very friendly personality and was enthusiastic in all the jobs he tackled. His popularity was exemplified by the fact that for his burial service the chapel was packed to overflowing with his friends from many walks of life (including most of the NE branch committee and the Institute secretary from London). He will be greatly missed by all his friends and the organizations with which he was connected. He leaves a wife and two daughters to whom we send our sincere sympathies.

D A Hall
(Senior Fellow)

Processing of membership questionnaires

K A Galloway, who is a retired member, has joined the staff at Devonshire Street on a temporary basis to help in developing the Institute's work in providing professional expertise on energy. He will, in particular, work on the register of members' special experience using initially the returns to the questionnaire enclosed with the 1986 subscription renewal notices. *Would any member who has not yet sent in his questionnaire please get in touch with him.*

Tony Galloway has recently retired from Esso UK, where for the last 10 years he was senior advisor on Energy Economics.

South Wales and West of England: Lunchtime lecture

The South Wales and West of England branch have organized the annual lunchtime lecture at the NCB Coal Research Establishment, Stoke Orchard, Cheltenham, Glos for 12 noon on Wednesday 18 June 1986. J E Talbot (chief systems engineer, British Aerospace) will speak on *Higher, faster, safer.*

Tickets and further information from A A Randell, NCB, CRE (tel 024 267 3361).

London and Home Counties: Report on March meeting

Prof Bodo Linnhoff of the Department of Chemical Engineering, UMIST spoke on *Energy saving through pinch technology* at the meeting of the London and Home Counties branch held at the Royal Institution on Thursday 13 March 1986. A summary of Prof Linnhoff's lecture is published on p 13 of this issue of *Energy World* in the Political and Economic section. It is hoped that the full text of the lecture will be published in a later issue of *Energy World*.

Fluidized bed combustion: assessment – concepts – perspectives: Conference, Essen (FRG), 3–5 June 1986

Organizer: VDI-Gesellschaft Energietechnik joint with DVV, DEBRIV, FDBR, STBV, VDEW, VIK.

Topics: Experiences with stationary and circulating FBC; combined processes and pressurized FBC systems; environmental protection; state-of-the-art in various countries; fundamental research and perspectives.

Further information and programme from VDI-Gesellschaft Energietechnik, PO Box 1139, D-4000 Düsseldorf, Federal Republic of Germany (tel 211/6214-216).

Value for monergy – improving cash flow through energy efficiency: CBI/ACE conference, London, 3 June 1986

The conference is being held as part of the CBI's contribution to *Energy Efficiency Year* at CBI Headquarters, Centre Point, London WC1 on Tuesday 3 June 1986. Many organizations have already cut 20% or more off their energy bills, but British business must not be complacent – there are

still enormous opportunities for savings in the public private sectors. A lack of proper appreciation of the financial aspects of energy efficiency projects, by all levels disciplines of management, is seen as the most serious obstacle to continued implementation of projects. The conference aims to present a unique financial approach to the subject and will be of particular value to financial production directors, auditors, engineers and management directors. Chairman: John Banham. Keynote address: Hon Peter Walker MBE MP, Secretary of State for Energy. Further information from Dorothy Harris (tel 01-7400).

Imperial College: May combustion research colloquia

Tuesday 20 May Prof Barry Moss (School of Mechanical Engineering, Cranfield Institute of Technology).

Flamelet modelling of turbulent combustion chemistry for practical fuels.

Tuesday 27 May Dr I Colbeck (Dept of Chemistry, University of Essex).

Smoke and the nuclear winter.

Colloquia to be held at 1545 h (tea available from 1530). Visitors welcome without fee or formality. Synopses of colloquia will be available a week beforehand and will be available on request. Further information from Prof F J Weinberg, FRS, Dept of Chemical Engineering and Chemical Technology, Imperial College, London SW7 2BY (tel 01-589 5951 ext 4360).

Gordon Research Conferences 1986

The 1986 Gordon Research Conferences will be held at various locations in New Hampshire, USA from 9 June to 4 July 1986. We publish below the programme of the conference on *Fuel science*, which will be held in the New Hampton School, New Hampton, New Hampshire from 3 June – 4 July 1986.

Fuel science:

30 June Syn-gas chemistry (Irving Wender, discussion leader): S Lee, *Role of carbon dioxide and water in the synthesis of methanol*; Kamil Klier, *Reactive intermediates and synthesis patterns in C₁-C₄ alcohol syntheses*. (Irving Wender, discussion leader): A Kiennemann, *Application of chemical trapping to the determination of surface species in synthesis gas reactions*; Stuart Hellring, *Mechanism of conversion of methanol to olefins and aromatics*.

1 July. Oil shale, shale oil and kerogen (V Dean Allen, discussion leader): Claudio Costa Neto, *Chemistry and geochemistry of Brazilian oil shales*; Francis P Miknis, *The nature of bitumen intermediates in the pyrolysis of Greenriver and Mississippian oil shales*; A Lamont Tyler, *Thermal solution selected Greenriver and Eastern US oil shales*. Inorganic chemistry of coal (Hal Gluscoter, discussion leader): Blaine Cecil, *Geochemical controls on the content and composition of mineral matter in coals*; Richard Bryers, *Fate of mineral matter during combustion of coal for steam generation*.

2 July. Characterization of heavy oils (Mieczyslaw Boduszynski, discussion leader): M Boduszynski, *Composition of heavy crudes as a function of volatility and solubility*; Malvina Farcasiu, *Structure of carbon skeleton in petroleum heavy ends*; Dieter Severin, *Composition of petroleum residues*; Application of new analytical techniques to analysis of fuels (Curt White, discussion leader): Hans Schulz, *New chromatography procedures in kinetic investigations of*

(continued on p

Conversions; Tom Aczel, *High resolution field ionization mass spectrometry in fuel analysis*.

July. Application of new analytical techniques to analysis of fuels (Curt White, discussion leader); Art D'Silva, *Laser-excited Shpol'skii spectrometry (LESS) fluorescence and laser ionization mass-spectrometry applied to fuel analysis*; Milton Lee, *The use of capillary supercritical fluid chromatography for characterization of fuels*; Kurt Zilm, *New NMR techniques applied to fossil fuel characterization*. (L L Anderson, discussion leader); Eugene Guccione, *Con men and fossil fuel prices*.

July. (Martin Gorbaty, discussion leader): selected poster presentations.

Poster sessions will be held on 1 and 2 July, 1700-1830 h.

Further information from Alexander M Cruickshank, Director, Gordon Research Conferences, Gordon Research Centre, University of Rhode Island, Kingston, Rhode Island 02881-0801, USA (tel (401) 783-4011/783-3372).

The British Coal Utilisation Research Association:

1986 Coal Science Lecture

The 1986 Coal Science Lecture will be given in the lecture theatre of the Royal Institute of British Architects, Portland Place, London, on Monday 20 October at 1730 h (tea 1700 h), by Prof J M Beér (Senior Fellow), scientific director, Chemical & Fuel Engineering, MIT Combustion Research Facilities, Massachusetts Institute of Technology. He will speak on: *Clean coal utilization, a science-based new technology*.

Application forms for tickets for the lecture will be loosely inserted in the July and August/September issues of *Energy World*.

Energy: needs/expectations: WEC 13th congress, Cannes, 5-11 October 1986

We published on pages 22 and 23 of *Energy World* (Dec 1985) a broad outline of the programme for the 13th World Energy Conference. The general programme is now available from E Ruttle, WEC secretary-general, 34 St James's Street, London SW1 1HD (tel 01-930 3966). This contains registration forms and details of the programme, all technical visits and the post-Congress study tours.

We publish below details of the programme for round table discussions, meetings of *ad hoc* working groups and experts' meetings.

Round table sessions

- RT1 Oil reserves: the changing perspective
- RT2 Coal utilization
- RT3 Growing role of electricity in the energy spectrum
- RT4 Energy problems of developing countries
- RT5 Energy in the Pacific Region
- RT6 Natural gas
- RT7 The future for nuclear power
- RT8 (topical subject to be decided)

Working group sessions

- WG1 Availability of thermal generating plant
- WG2 Rational use of energy in agriculture
- WG3 Environmental effects of energy-related pollutants
- WG4 Present & future energy supply & demand
- WG5 Isolated domestic energy markets: the case of gas
- WG6 Energy consumption in industrial processes
- WG7 Long-term investment requirements in the energy sector: needs, constraints & proposals
- WG8 Energy for rural households

Experts' meetings

- EM1 Methanol from coal: prospects
- EM2 Heat pumps
- EM3 Ocean thermal energy conversion
- EM4 National energy data
- EM5 Energy information: access to centres & data banks
- EM6 Energy terminology: a multi-lingual glossary
- EM7 Critical examination of forecast studies in the seventies

1986 Manufacturing Effectiveness Competition

The 1986 Manufacturing Effectiveness Competition has been organized by the Institution of Mechanical Engineers. The Award, a City initiative in support of industry, is sponsored by leading insurance brokers Willis Faber. As with the first two such events in the series — 1982 and 1984 — an award of £10 000 is being offered by the sponsors for the best case study of a current improvement in manufacturing effectiveness in the UK manufacturing industry. £4000 in prizes will also be presented to the other finalists in the competition. The Award Day will be *Tuesday 11 November 1986*.

Notification to enter is required by 2 June and the submission of papers by 15 July. During September and October the preliminary judging panel will arrange for visits to the companies where the success story is located, both the contributing team and management on the site being interviewed.

The final presentations, at IMechE's London HQ, will each comprise 15 minutes followed by questions from the final judging panel. Attendance will be open to the general public. Further information from Peter Pugh, manager, Engineering Industries Division, Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ. (tel 01-222 7899).

British Gas: New trophy for energy management groups in 1986

A new award will be presented by British Gas later this year to the energy management group which makes the most significant contribution to the success of *Energy Efficiency Year*.

The judging panel from British Gas, the Department of Energy and Salford University, will take into account how energy efficiency has been promoted within the local community by each group. Public meetings, involvement with chambers of commerce and trade associations, as well as education and training initiatives, will be considered. Other factors include the increase in group membership and the numbers of members and non-members attending meetings together with the range of subjects covered during *Energy Efficiency Year*.

The use and advancement of monitoring and targeting of energy consumption with information on savings in 1985 and projected savings for 1986 are also to be considered.

Groups are asked to prepare written nominations, supported — where possible — by programmes, press cuttings and other written material. Submissions should be sent to regional energy efficiency officers by 22 August.

The Award will be presented to the chairman of the winning group at the 1986 National Energy Management Conference at the National Exhibition Centre in December. Members of the winning group will be invited to a reception to be held early in 1987 and will receive appropriate mementoes.

Further information from the Public Relations Department, British Gas, Rivermill House, 152 Grosvenor Road, London SW1 3JL (tel 01-821 1444).

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CONFERENCES

The following conferences, courses and meetings are organized by bodies other than the Institute of Energy. For Institute meetings please see page 1

May 1986

Fluid mechanics and chemistry of the combustion process

Technical meeting, Cleveland (OH, USA), 5 and 6 May 1986.
Details from Dr Larry A Diehl, NASA Lewis Research Centre, 21000 Brookpark Road, MS 500-200, Cleveland, OH 44135, USA.

Environmental and conservation influences on West European energy balances

Seminar, London, 7 and 8 May 1986.
Details from Miss R Maguire, Joint Energy Programme, Royal Institute of International Affairs, 10 St James's Sq, London SW1Y 4LE (tel 01-930 2233; tx RIIA 896691).

Efficient energy utilization

Conference, Stockton-on-Tees, 14 May 1986.

Details from M G Burbage-Atter (conference organizer), Teesside Polytechnic, Department of Civil and Structural Engineering and Building, Middlesborough, Cleveland TS1 3BA (tel 0642 218121).

Unconventional gas recovery

Symposium, Chicago (USA), 18-21 May 1986.

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

The new materials

Lecture, by Dr A Kelly (vice-chancellor, University of Surrey). Royal Society, 19 May 1986 at 1800 h. Details from Royal Society, 6 Carlton House Terrace, London SW1Y 5AG (tel 01-839 5561 ext 277).

Total risk and benefit impact of energy alternatives

International symposium, Waterloo (Canada), 19-23 May 1986.

Details from Dr H D Sharma, chairman, Energy Symposium, Dept of Chemistry, University of Waterloo, Ontario, N2L 3G1, Canada (tel (519) 885-1211).

Development of alternative energy sources

International conference, Grand Forks (ND, USA) 23 and 24 May 1986.

Details from Sundar S Salvja, chairman, UND Energy Conference, Department of Geology and Geological Engineering, Box 8068, University Station, Grand Forks, North Dakota 58202, USA (tel (701) 777-2661).

June 1986

South African energy

Conference, Pretoria (South Africa), 9 and 10 June 1986.

Details from Organizing Committee, c/o Energy Research Institute, UCT, Private Bag, Rondebosch 7700, South Africa (tel 69-8531 ext 128; tx 5-21439).

Solidex 86

Fourth solids handling conference and exhibition, Harrogate, 10-12 June 1986.

Details from Trinity Publishing, Station Approach, Long Lane, Hillingdon, Middlesex UB10 9NR (tel (0895) 58431; tx 8813047 RB LONG).

Energy technology

Eighth annual conference, Houston (TX, USA), 17-19 June 1986.

Details from M A Williams, Public Utility Commission of Texas, 7108 Waterline Road, Austin, TX 78731, USA (tel (512) 345-8052).

July 1986

The European fuel oxygenates market

Conference, London, 1-2 July 1986.

Details from Alcohol Week, PO Box 7167, Benjamin Franklin Station, Washington, DC 20044, USA (tel 202-347-2122 (in the USA toll-free 800-424-9068); tx 5106010646).

High-temperature corrosion

International symposium, 7-11 July 1986.

Details from Cefracor, 28 rue Saint-Dominique, 75007 Paris, France (tel (1) 705 1073).

Integrated engine transmission systems

Conference, University of Bath, 8-9 July 1986.

Details from Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London SW1H 9JJ (tel 01-222 7899; tx 917944).

Hydrogen energy

Sixth world conference and exhibition, Vienna (Austria), 20-25 July 1986.

Details from: (conference) Inter-convention, POB 80, A-1107 Wien, Austria (tel (0222) 576288; tx 111210); (exhibition) K Kreiner & Co, Postf 105, A-1014 Wien, Austria (tel (0222) 632199; tx 61-3222286).

August 1986

Combustion

Twenty-first international symposium, Munich (Federal Republic of Germany), 3-8 August 1986.

August 1986 (continued)

Details from T Kolb, Lehrstuhl f Flugantiebe, TU Munich, Arcisstr 21 D-8000 Munich 2, FRG.

Drying

Fifth international symposium, MIT (Cambridge, USA), 13-18 August 1986.

Details from Prof E Crosby, Chemical Engineering Department, University of Wisconsin, 1415 Johnson Drive Madison, WI 53706, USA (tel (608) 262-8932).

Heat transfer

Eighth international conference, San Francisco (USA), 17-21 August 1986.

Details from A E Bergles, Mech Eng Dept, Iowa State Univ, Ames, IA 50011, USA.

Underground coal gasification

Twelfth annual symposium, Saarbrücken (FRG), 25-28 August 1986.

Details from 12th UCG symposium 1986, Prof H J Schloemer, Technical Mineralogy, University of Saarland, D-6600 Saarbrücken, FRG (tel (0681) 302 2912; tx 4428 851 unis d).

August/September 1986

Coal preparation

Tenth international congress, Edmonton (Canada), 31 Aug-5 Sept 1986.

Details from Neil J Duncan, general chairman, 10th ICPC, Comp 137, RR1, 108 Ranch, 100 Mile House, BC, Canada VOK 2E0 (tel (604) 791-5494; tx 055-62344 (CIMM MTL)).

September 1986

Gas research

International conference, Toronto (Canada), 8-11 September 1986.

Details from Gas Research Inst, 8600 W Bryn Mawr Ave, Chicago, IL 60631, USA (tel (312) 399-8300; tx 253812).

Swissdata 86

Exhibition, Basel (Switzerland), 9-13 September 1986.

Details from secretariat, Swissdata 86, Postfach CH-4021, Basel, Switzerland (tel 061 26 20 20; tx 62685 fairs ch).

Courses (overseas)

Coal slurry combustion technology.

Copenhagen, Denmark, 14-15 May 1986, followed by study tour to Sweden, 16 May 1986.

Fluidized bed combustion technology. Copenhagen, Denmark, 19-20 May 1986.

Details for both courses from DELTA-H Institute, PO Box 1053, Springfield, New Jersey, 07081, USA (tel (201) 654-9633; tx 238-667 ATT DELTA).