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Letter

Independent energy managers

May I congratulate Dr Steven Fawkes on his personal viewpoint *Challenges for energy management* (*Energy World*, October 1988). His viewpoint is almost entirely in accord with my own. Energy management is now being understood in the much wider context of environmental pollution as well as cost saving, but we must be instrumental in improving the appeal of energy efficiency and conservation to a much wider public in order to make in-roads into improving the energy efficiency of the housing stock.

As Dr Fawkes is aware, many organisations are involving their energy managers in planning for new plant and even decisions on the effect of new, energy efficient equipment to the field of maintenance.

Whether we enter the international scene will depend entirely upon the efficiency with which we organise ourselves. It will necessarily be sometime before we are in a position to pick up this particular challenge.

One subject not mentioned by Dr Fawkes is the desire of Energy Management Groups to remain independent. This is seen as a fundamental principle by most Energy Management Groups although we do not necessarily feel that this precludes a positively led national organisation.

The proposed aims of the new National Energy Management Association are too extensive to include at this point. However, when the first positive steps have been taken towards the formation of a National Association, the information will be freely available (early 1989).

M G Brill

Chairman, Central London Energy Management Group

Engineering in the regions

Graham Anthony

Since its formation in 1981, the Engineering Council has always considered that the 300 000 registrants nationwide should play an important part in promoting and developing the engineering dimension throughout British society. We are operating on three broad fronts: to stimulate awareness, improve supply and raise standards. We recognise that success will not come overnight and that many years of determined and co-ordinated actions will be needed before 'engineering' is able to gain its rightful place in society and earn the status we all believe it deserves

Six years after it got underway, the Council has become financially independent: enjoys strong support from the engineering institutions and its Industrial Affiliates, all employers of engineers and technicians; and has made direct impact on government actions in several different directions, such as:

- Tackling the shortage of maths and physics teachers.
- Widening the entry to higher education institutions.
- Creating more undergraduate places for information technology and manufacturing systems engineering.
- Increasing the numbers of women taking up science and engineering careers and developing the career break for women.
- Widening the school curriculum with double award balanced science and AS levels.

The ECROs

Once these national initiatives were underway, we were able to devote more resources to the 19 Engineering Council Regional Organisations (ECROs). Under the chairmanship of Sir Robert Telford, the Engineering Council Regional Organisation Co-ordinating Committee (ECROC) began meeting regularly and gradually coherence has developed throughout the ECROs.

Each ECRO has a chairman, supported by a committee, secretary and treasurer. To underline our priorities each ECRO also has officers responsible for public relations and careers and education. Since all those involved in the ECROs are already members of one or more of the 46 nominated bodies the ECROs enjoy a rich mix of representation of interests. This provides a splendid basis to co-ordinate activities of the profession of engineering and complement the local activities of each institution.

Clear evidence of the Engineering Council's commitment to regional affairs can be seen from the 30% increase year on year of funds allocated to the 19 ECROs. The £144 000 in 1986 has risen to £225 000 in 1988 and further increases are projected. Two staff are engaged full-time in assisting the people in the ECROs to meet their objectives.

But money is not enough. We shall need the commitment from many thousands of members of the engineering profession nationwide so that the ECROs

become focal points for achieving real and lasting local partnerships between education, industry and commerce.

The first major step with ECROs was to promote *Opening windows on engineering*, in which younger engineers and technicians talk to youngsters in schools about their jobs. Building on the pioneering work of some institutions, we set an ambitious target to ensure this was available in 80% of Britain's 8000 secondary schools by 1990. From a rather slow start we are encouraged by the progress now being made in each region, stimulated and supported by industrial affiliates who see the scheme as providing excellent career development experience for their younger engineers and technicians.

The next priority was to encourage each ECRO to establish effective administrative systems to be able to link with their registrants in order to harness their enthusiasms and involve many more engineers and technicians in our local activities. Five regions have opened their own offices and others will follow.

Liaison with schools

Following discussion with all the nominated bodies in November 1987, we received strong signals to bring much more co-ordination to school liaison activities. Proposals have now been published in a document entitled *5-19 liaison, a co-ordinated programme to capture young people's imagination*.

The essence of this plan is to concentrate on three key areas of school liaison:

Curriculum development: so that all pupils experience a broad-based balanced and relevant education from which they can continue their education and training throughout life.

Careers advice: to clarify the engineering message and ensure effective delivery to pupils, parents and teachers by ensuring that opportunities at all levels in the profession are explained.

Community involvement: so that in each region the profession of engineering becomes an authoritative voice to promote positively the local community's involvement in education.

Neighbourhood engineers

With the active support of engineers and technicians in Devon and Cornwall and South Wales, we have been developing the Neighbourhood Engineers Scheme in

*Director, Industry and Regions, the Engineering Council

which engineers and technicians are informally linked to local schools. This will be the vehicle over the next five years to link about four neighbourhood engineers to each of our 8000 secondary schools. In this way our three key activities can be promoted in all regions and delivered sensitively to satisfy the special needs of each school. Thus all aspects of the engineering message can be conveyed in a friendly but effective way to help the young people, their teachers and parents.

This scheme is being eagerly welcomed by the Department of Education and Science and the local education authorities. The Department of Trade and Industry has funded a major development project on Merseyside and Cheshire which is now well in hand. This will involve some 225 schools and be the first chance for neighbourhood engineers to become active in large numbers.

The challenges ahead

To obtain and maintain some 32 000 people active in our secondary schools is a major challenge to the profession of engineering. So, in due course, when you are approached by your local ECRO to become involved, we hope you will respond to the call and make your own positive contribution to your profession and help assure the future supply of engineers and technicians from our schools by agreeing to become a neighbourhood engineer in a school in the vicinity of your work or your home.

If you would like to contact the Secretary of your local ECRO please write for a list to: Regional Affairs, The Engineering Council, 10 Maltravers Street, London WC2R 3ER. Tel: 01-240 7891.

Conference report

Fluidised combustion in practice: clean, versatile, economic?*

J S Harrison†

It is not obvious at first sight why special conferences are held about fluidised combustion which, after all, is only one technique among many for burning fossil fuels. When fluidised combustion was introduced originally it offered the first promise of a breakthrough in combustion technology for perhaps 100 years. In those days the technology had to overcome strong opposition, for example it was argued that burning coal in a fluidised bed would be inefficient because of the high production of carbon monoxide, and in any case the ash would sinter and the whole system would soon solidify

It was soon demonstrated that these fears were unfounded, and enthusiasts chiefly from the UK and the USA came together to found an international fraternity of fluidised combusters. They emphasised the ability to burn a wide range of gaseous and liquid fuels, high ash coal and coal of variable properties. They highlighted the ability to trap oxides of sulphur and the high rates of heat transfer in fluidised beds. They also noted that the benign combustion conditions, the complete absence of erosion and the low temperatures would enable cheap materials and cheaper methods of construction to be used thereby reducing the cost of commercial plant.

Not all these promises have been fulfilled, although successive conferences have demonstrated achievements in realising many of the early hopes. However,

they have also highlighted problems that were not foreseen in the early days. The aim of the 1988 conference was to review fluidised bed combustion as it is now practised, but not forgetting the new ideas and the better theoretical understanding of the present.

In particular, the organising committee wanted to demonstrate that in practice fluidised bed combustion leads to clean operation, flexibility in respect of fuel supply and performance, and to establish the overall economies to be gained.

In order to review achievements in practice it is interesting to look back to the hopes expressed at the time of the first conference on this subject organised by the Institute in 1974:

- i *Atmospheric fluidised beds would burn a wide range of fuels including normal bituminous coal, high ash coal, colliery wastes, oil and gas*
Experience has confirmed these expectations. units are operating all over the world from 1 MW to 160 MW. They use a wide range of fuels including refuse derived fuel. However, the fuel flexibility of individual units is not always as great as originally hoped. The special needs of particular

*The conference organised by the Institute of Energy took place at the Scientific Societies' Lecture Theatre on 12-13 December 1988

†Director, Coal Research Establishment, British Coal and chairman of the Conference Organising Committee. Mr Harrison is a fellow of the Institute of Energy

fuels and the special duties required by particular plant have led to many types of fluid-bed combustion beyond the expectations of the 1970s. There are now shallow beds, deep beds, beds with internal circulation, beds with external circulation and multi-solid beds. Practical problems of all these were reported at the conference. In addition some new ideas were put forward which, like many new ideas, did not suffer the disadvantages of the more established plant. There is, however, a whole range of commercially operating plant with high reliability, high availability and high flexibility of operation.

ii *The second hope was related to the availability of cheaper methods of emission control, compact design and the use of cheap materials and cheaper methods of construction*

In relation to emission control, low cost sulphur retention has certainly been proved. Low NO_x can be achieved, but work reported in the conference showed that care was needed to avoid the impairment of sulphur retention. Practical experience has shown that cheap materials and cheap methods of construction have not so easily been achieved. Various papers discussed the erosion/metal wastage from fluidised beds. In particular, work done by CRE and EPRI over wide ranges of conditions showed considerable success in overcoming materials problems. The conference was impressed by the mature view shown by EPRI and the USA generally in recognising the successful overcoming of problems as a stepping-stone to even greater benefits.

iii *There was emphasis in the 1970s on the need for a fundamental understanding of the fluidisation process through the development of mechanistic models*

The conference reviewed the considerable advances made on both hot and cold models. A wide and sometimes bewildering range of dimensionless groups have been used to characterise fluidisation phenomena. The most successful were those used by Geldart and Glixman; work in Holland introduced further refinements. Small fluidised beds are relatively well understood, but caution is still required in predicting behaviour of

large beds. Although plant design did not wait for the development of complete understanding, it is evident now that the fundamental work is helping in practical ways to solve problems in the design of commercial plant.

iv *It was hoped in the 1970s that pressurised fluidised combustion could be used to fire a gas turbine*

In the UK considerable progress has been made on the development of pressurised systems. The programme at Grimethorpe was funded internationally and the achievements were reviewed at the conference. There is now considerable confidence in the engineering design of small-scale power plant of the type likely to be of interest in the UK electricity supply industry. There is a high level of interest in the plants being built in the USA, Spain and Sweden, which it is hoped will prove the basic technology of firing turbines with combustion off-gases. In the UK proposals are under review for the development of improved cycles in which the off-gas temperature is raised by the combustion of gas, either natural gas or coal-derived gas. An increase of 20% efficiency might be obtained in this way.

The title of the conference ended with a question mark. The answer at the end of the conference was that fluidised combustion had been proved in practice to be clean and flexible in operation, the economics of atmospheric beds had been well established and pressurised systems were on the threshold of being proven.

As the chairman of the organising committee I should like to acknowledge that the success of the conference on the day depended on the chairmen and presenters, all of whom performed to a very high standard. The rapporteurs, for parts of two of the sessions, Prof R Clift (University of Surrey) and Prof J F Davidson (University of Cambridge), contributed greatly to the success of the conference not only in summarising the authors' papers but by themselves analysing and adding their own very fruitful interpretations of the information in the original papers.

Thanks are also due to the Institute staff, particularly the secretary, Colin Rigg, and Mrs Jill Leigh who came in half way through the organisation period and did a magnificent job in achieving a professional operation for the conference that was appreciated by delegates who came from 18 countries.

Future conference

Industrial energy management
16-18 May 1989
at NEC, Birmingham

The conference is being held in conjunction with **ENERGY '89**, a major exhibition being organised by EMAP Maclaren Exhibitions.

For more information contact: Mrs I. Hutchings on 01-660 8008

Cooling down nuclear power

John Regan*

In common with all man made structures nuclear power stations eventually become outdated. The onset of obsolescence can be delayed, but in the end the products of industry will become obsolete. The first nuclear power stations are reaching what is normally considered to be the end of their working lives and these will in time be decommissioned. The CEGB recently announced that they intend to close Berkeley Nuclear Power Station which commenced commercial operation in 1962. In Italy, Latina, a Magnox station, has been closed. By the year 2000, there will be 25 power reactors in the UK that will be 30 years old. These represent billions of pounds worth of work for companies with the expertise and experience to undertake decommissioning projects. The rate of decommissioning these nuclear power stations will depend upon a number of factors. One will be that the site represents a valuable resource, which if free, could be reused for the construction of further stations

The term 'decommissioning' originally comes from removing a ship from 'commission' which usually meant that the ship went to the breakers yard. In the nuclear power industry it has acquired a special meaning and it has become customary to use three basic stages when defining the process of decommissioning. They are:

Stage 1

Shut down reactor, cool system, depressurise, remove all fuel, make the plant safe and keep under surveillance. No plant or building are dismantled.

Stage 2

Dismantle all non-radioactive and radioactive plant and buildings external to the biological shield. Seal off the remaining buildings and keep under surveillance.

Stage 3

Dismantle the remaining plant and buildings and remove all waste material off site so that the site may be released for re-use or more general use by the public.

Various decommissioning options have been assessed and generally favour a delayed decommissioning plan. In the delayed situation, the reactor is taken through to the Stage 2 decommissioned state and stored for a period to allow most of the significant gamma contributors to personnel dose to decay to a low level.

In certain situations it may be more acceptable to proceed through to Stage 3 without delaying at Stage 2. This happened in the USA at Elk River, a 22 MW(e) BWR (boiling water reactor) demonstration plant, where the reactor was decommissioned at Stage 3 and the site is now a car park. The Windscale AGR is being decommissioned to Stage 3 to demonstrate the technical feasibility of dismantling a gas-cooled reactor safely. The 60 MW(e) Shippingport PWR nuclear

power station is also being decommissioned through to Stage 3 without a delay at Stage 2.

The value of these pioneering decommissioning projects is that they will confirm the evaluation of costs, radiation exposure and waste volumes generated during the decommissioning process.

Strategy for decommissioning

Nuclear power stations can be broadly divided into three decommissioning zones. The first zone includes the components within the concrete biological shield. These items are the pressure vessel, the graphite core and support structure which contained the fuel and the associated equipment. For the operating life they have been in a neutron fluence and are therefore activated. For example, some of the Cobalt 59 in the steel will become Cobalt 60 (neutron/gamma reaction) which has a 5.3 year half-life.

The second zone contains plant and structures outside the biological shield. Some components may be contaminated by the primary coolant that has circulated through them, for example, the heat exchangers in the case of the Magnox gas-cooled reactors. The fuel pond, active effluent plant and so on will also be contaminated.

The third zone will be non-active plant such as the turbine hall, diesel house, offices etc.

The materials that have been in the neutron fluence, that is the activated material, will decay at a rate depending on the half-life of the isotopes produced in the activated material, for example, the activity of Cobalt 60 will reduce by half every 5.3 years. This type of radioactive material is better left to a delayed Stage 3. Some of the surface contaminated material may be cleaned (decontaminated) to a non-active level.

Whether the early or delayed Stage 3 decommissioning route is chosen will depend upon social, economic and technical demands. There are good reasons for delaying Stage 3 decommissioning, one is that the dose commitment to dismantling staff would be reduced as far as practicable which would comply with the ALARP (as low as reasonably practicable) principle.

*Group head of Decommissioning Studies, National Nuclear Corporation

Process of decommissioning

The precautions taken to protect the public and the station staff would be continued throughout the decommissioning process. The precautions include containment, shielding, special ventilation systems with HEPA filtered discharges, and full radiological controls to ensure that radiation doses are as low as reasonably practicable.

The Stage 1 decommissioning process will probably be carried out by the station staff. They would shut down the reactor and dispatch the fuel to the reprocessing establishment. This process will remove 99.99% of the radioactivity which is on the site when the reactors are operating.

Stage 2 decommissioning is, therefore, concerned with reducing the building area and establishing the service requirements of decommissioning. Certain services and facilities will be retained during this decommissioning phase. A welfare building and an administration control centre will be required which would incorporate radiological control and a radioactive waste movement record service.

The emphasis will be on 'good housekeeping' to avoid spreading contamination or creating a hazard either to the decommissioning staff or the general public.

At the end of Stage 2 decommissioning the aim should be to have removed everything outside the biological shield (Fig 1). The top of the structure would be the pile cap level, suitably treated with weatherproof concrete finish. The block (or blocks for twin reactor stations) will be about 25 m above ground level and approximately 35 m x 35 m for a typical Magnox reactor. This will be a sealed concrete box with maybe

a couple of entry points for inspection and a suitable vent.

Such robust blocks of reinforced concrete could be left for 60 or more years with minimum surveillance as entry could not be gained without the use of sophisticated cutting techniques. In any event the contained activity, in the form of tons of steel and graphite is not easily dispersed. If such structures started to leak, dispersion to the environment would be at a very slow rate and well within acceptable levels.

If Stage 3 decommissioning is left until about 100 years after shutdown, the remaining activity is dominated by isotopes which are low energy beta emitters namely C14 and Ni63. This means man access will be possible and there would be less reliance on remotely controlled devices.

Active waste management

Decommissioning nuclear facilities will produce radioactive waste and therefore any decommissioning process must be related to the radioactive waste disposal route. The indications are that this could prove to be an expensive part of the decommissioning process and may be the tail that wags the decommissioning dog.

In the UK radioactive waste is divided into three broad categories: low-level (LLW), intermediate-level (ILW) and heat-generating waste.

When the fuel from the early Magnox stations has been discharged and removed from site, only LLW or ILW will remain. During Stage 2 relatively large volumes of LLW will be produced. The principal sources of LLW during this stage will be the large external ducts and heat exchangers, the fuelling machine, the active effluent treatment plant and the fuel pond.

For an effective decommissioning campaign, it is important to establish an active waste disposal route. Any delays in establishing a disposal route will reflect back on the Stage 2 decommissioning process. For example, if such delays occur, it may be necessary to store waste on site for a period, or possibly leave the larger components *in situ*.

Decommissioning and design

At the design stage of the nuclear power station it has become necessary, in many countries, to submit a decommissioning proposal. This provides the designer with the opportunity to examine the design approach, and influence the project in a manner which will ease the task of those, who, in 50 to 100 years time, will have to decommission the nuclear power station.

The rapid advance of technology over the past 50 years has brought about the development of the nuclear power station. It is not unreasonable to anticipate that, in the next 50 years, remote handling techniques will be developed to the point where dismantling of the same nuclear power stations will be a significantly simpler task. Nevertheless, it would be wise to show that the station could be decommissioned using current dismantling/demolition techniques. The description of the techniques proposed should form part of the permanent record.

Stations can be successfully decommissioned using established techniques in radiological control, decontamination, remotely controlled operations and waste

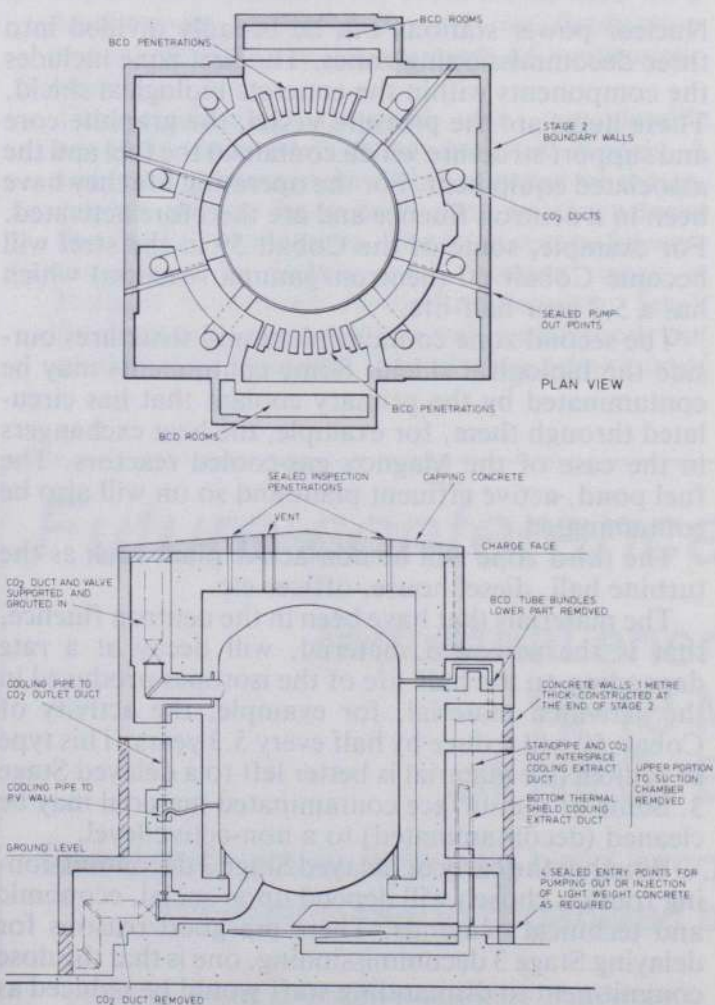


Fig 1: Typical Stage 2 boundaries.

Continued on p. 16

The tolerability of risk from nuclear power stations

**Health & Safety Executive
HMSO 1988
36pp. £4.95**

This document arises from a proposal by Sir Frank Layfield in the report of the Sizewell public inquiry. Its aim is to provide a 'straightforward account' for the 'general public' and act as a source of public, expert and parliamentary informed opinions.

The whole subject of risk as applied to human activities, the derivation of numerical factors for establishment of tolerable or acceptable levels is both complex and often highly subjective. Whether a risk is worthwhile depends on judgment and for an individual, on personality, background and often age. This is clearly an area where engineers and scientists feel unhappy: criteria for most engineering judgments can be established by the objective evaluation of technical facts. However, even in engineering decisions often have to be taken using inadequate information.

The Health & Safety Executive report is about how to form judgments from a mixture of well established statistical data and 'guesses' (or estimates!) from areas where statistics are poor. Added to this mix of cold data are the human factors or decisions made during design fabrication and operation of complex plant.

The report faces up to these problems in leading the reader through a general survey of the background to risk evaluation, its regulation by statute, by industry and an independent government financed inspectorate with sweeping powers to make sure that industry meets its responsibilities. The principle is that risk should be as low as reasonably practicable, which means that with advances in technology the standards required will become tighter. This is the approach used in dealing with plant emissions and, as is well known, frequently leads the United Kingdom into conflict with the other members of the European Community.

Applying these principles to nuclear installations the inspectorate uses a system of licensing. The operator, who is responsible for plant safety must consult the Nuclear Installations Inspectorate (NII) at all stages of construction, commissioning and operation of nuclear plant and the inspectorate also has the power to insist on actions by the operator if he considers these to be necessary. This is the legal framework of nuclear plant safety in Britain.

There is a short section on risk assessment and an outline on the dangers from radiation and the selection of legal dose limits in Britain for

employers at nuclear plant and the general public.

The section on the risk of accidents is a clear and useful outline on how safety and risk evaluation is considered by the plant designer with the way in which the need for standby emergency systems is established to provide a sufficiently remote chance of faults leading to significant releases of radiation from the plant. The principles of redundancy and diversity are given and the thorough analysis of risk assessment carried out on nuclear plant is outlined. There is mention of natural events like earthquakes, impact of a large meteorite or flooding (surely more likely if some of the predictions of the effects of the Greenhouse Effect are proved). The conclusion is that nuclear reactor power plants are built with such heavy and massive construction that they are less prone to damage than most other industrial installations. Aircraft crashes on nuclear power stations are not mentioned but presumably can be dealt with by routing flight paths away from these plants.

On the human factors the problems start at the design stage and extend through construction and alterations to the original design to operation and maintenance. The systematic approach to design and the use of quality control techniques are noted. In operation and maintenance the report rightly points out that human beings do make mistakes but that they also have the capacity for making sound judgments in unusual situations. Training and a regime in which safety is paramount at all times will ensure that dangerous errors or omissions are very unlikely. However, the use of automatic controls and provision of interlocks and protective devices that cannot be bypassed (as at Chernobyl) provide the operator with the confidence that the plant will behave safely. The speed at which changes occur in nuclear plant is slow, the Chernobyl accident was exceptional, allowing judgment and assessment of actions to be analysed. However, the operators can only make good decisions if given sound and unambiguous information; the Three Mile Island accident occurred because the operators misinterpreted information from the instrumentation on the plant.

What risk is tolerable brings in the comparisons between various types of risk and the way in which the executive justifies the figures for nuclear plant. These are annexed giving data for the various levels of risk from a wide range of industries and activities, a list of major disasters in Britain and abroad. There are interesting data on the probability of a selection of incidents causing immediate deaths in Britain. For example, there is one fire a year killing 10 or more people, an event at Canvey Island killing or injuring more than 1500 people has a chance of occur-

ring of one in 5000 per year. An uncontrolled release of radiation from nuclear power plants is put at between 1 and 700 000 and one in one million per year. It would appear to be much safer to live near Sizewell than at Canvey Island.

This report is therefore useful both for publicising in straightforward terms what is done to make nuclear plant as safe as 'reasonably practical' while showing what the experts feel to be statistical likelihood of dangerous releases of radiation to the public, and plant operators. It is therefore to be recommended to all who are interested in the topic.

The document is careful to recognise the worries certain groups have about nuclear power. However, the main purpose of the report is to summarise how the safety of nuclear plant is assessed. I feel that the special nature of the effects of how radiation and the way the official figures of 'casualties' is not fully presented. The report rightly states that there is no evidence that small increases in radiation level cause a higher incidence of deaths from cancer and the differences in natural radiation between locations and populations are much higher than the extra radiation, even locally, calculated local to the reactor from serious nuclear incident. But a key factor is that the cancer that would arise from radiation would not show themselves for 20 years or so. Enormous strides have been made over the past 20 years both in detection and the cure of many cancers. It is therefore likely that medical science will in fact be able to detect and treat successfully more cancers in the future than at present. So it is probable, even if the unproven figures for increasing cancers from small extra doses are accepted, that a high proportion of them would be cured and not, in fact, lead to premature death. Radiation is different from most other risks in that there is this time lag which offers the opportunity of early detection and a cure.

It is perhaps worth noting that a most useful and readable book, *Living with risk*, deals with a wide range of risks in human activity. Read in conjunction with the official Health & Safety Executive report this book helps to put many aspects in clear perspective.

N G Worley

Modern applied energy conservation

**Edited by J K Jacques, J B Lesourd and J M Ruiz
Ellis Horwood, 1988
405pp. £55**

One of the best all round books on the management of energy that I have come across. The book deals with all aspects

of energy management, starting with an evaluation of the available fuels, through to the planning and implementation of energy saving projects. It is based on applying the principles of business management to, in the editors' words, 'energy conservation management'.

The opening chapter on energy management in general contains some very useful tips and philosophy on energy management, that would very effectively focus the mind of a newcomer on the subject. The following chapter on the energy market contains some very interesting historical data of energy sources and costs, which while very useful in understanding the mechanisms of energy prices, could be dangerous if attempting to use the data for forecasting. Often politics are a more determining factor than natural selection.

The chapter on energy auditing and accounting, while a trifle long, does deal with the subject comprehensively, including an excellent selection of references for future reading. Included in the appendices to this chapter is a section on statistics and pinch technology, which while 'heavy', is a good introduction to both subjects. There is also a useful self-assessment section to test just how much the reader has understood.

The book flows naturally into a chapter on investment decisions, with some simple case studies, followed by a chapter on the organisation of energy management. I found the latter the least convincing of all the chapters in the book, being heavily orientated to the theory of good energy management.

The final part of the book concentrates on strategic issues, including decision trees, linear programming and the like, with a good selection of case studies. Overall an excellent book, with items of interest for both the beginner and the expert. I found the book very readable, the additional references useful. I will certainly be using it in the future.

Brian Chamberlain

Particulate control for coal combustion

Jonas S Kingspor and Jan L Vernon
IEA Coal Research, London, 1988
70pp. £180 (non-member countries),
£60 (members)

Although control of particulate emissions by a variety of methods is a mature technology, a wide range of work is under way to improve the applicability, performance and cost-effectiveness of particulate control equipment. The authors of this book show that despite the long history of particulate control devices, the fundamental mechanisms by which they operate are not fully understood. Improvements to existing technologies and the developments of new particu-

late control technologies have been stimulated by the introduction or proposal of stringent emission standards (for both particulates and other gaseous pollutants) in many countries, and by the development of new combustion and gasification technologies.

The report shows that particulate control technologies in commercial operation are mainly mechanical collectors, electrostatic precipitators, fabric filters and wet scrubbers. Of these, only electrostatic precipitators and fabric filters are capable of meeting stringent standards economically on most of the larger combustion sources.

Mechanical collectors are more widely used on the smaller boilers which are subject to less stringent emission standards and boilers such as chain grate stokers where uncontrolled emissions are low.

Historically, electrostatic precipitators have been the dominant control device for utility boilers. More recently, the use of fabric filters on utility boilers has steadily increased. Fabric filters have also been more widely used on industrial-scale boilers.

Each type of collection device is able to work on a range of different combustion systems, in both new and retrofit applications.

Although there is considerable experience in the collection of particulates, problems with accurate performance prediction (and detailed design requirements) continue. Resistivity of ash in precipitators and pressure drop in fabric filters is still subject to unexplained variations. Practical testing on different types of fuel may be necessary to determine the appropriate design of collection equipment. For both precipitators and fabric filters, start-up, shut-down and changes in gas flow rate can cause appreciable efficiency problems.

It was encouraging to read that development work on particulate control technology shows potential for improvements in the performance, applicability and cost-effectiveness of all types of collectors. Promising new developments for mitigating the adverse effect of high fly ash resistivity on precipitators include large diameter electrodes, gas conditioning, pulse energising, pre-charging, multi-stage precipitators and wide-plate spacing.

Fundamental studies of fabric filters have indicated that their operation is more complex than initially thought and they have been shown to be influenced by the characteristics of the dust cake which builds up on the bags. A better understanding of the dust cake and filter material interface has thus developed. Mechanical collectors are also the focus of continuing development, particularly for use in high temperature and pressure environments where other control technologies are more difficult to apply.

The selection of particulate control approaches is shown to be further complicated by the need to consider other types of combustion pollutants, as the

pressures to reduce SO₂ and NO_x emissions continue to grow. Particulate control may be affected both by the use of control equipment to reduce these emissions, and by the use of new combustion technologies which promise reductions in uncontrolled emissions as well as increased efficiency.

This report shows that particulate control is undergoing considerable change, brought about by developments in combustion and control technologies together with increased environmental pressures. Messrs Kingspor and Vernon conclude that the future is likely to bring stricter requirements for control particulate emissions, but with a range of more efficient, more widely applicable, and more cost-effective methods available to meet those requirements.

Andrew W Cox

Guide to industrial coal and ash handling

British Materials Handling Board
244pp. £45

This book provides guidance on the fuel and ash handling aspects of installations using grades of coal commercially available in the UK, either as supplied from coal treatment plants or after milling to form pulverised fuel. It covers the design criteria for plant, types of coal and their definition, reasons for differences in cost, methods of transport to the consumer, reception and storage, extraction from stock, conveying and feeding, milling, drying and handling of pulverised coal (where applicable), metering of the feed to the furnace, ash collection, handling and disposal, and dust control and collection. Risks, particularly those associated with pulverised fuel, are also discussed.

The guide covers the concept of the plant as an integrated handling system, plus equipment selection, management of plant operation, stock and quality control, operability and reliability problems. The authors also examine health and safety, laws and regulations affecting coal users, precautions against accidental fires or explosions plus methods of limiting damage from spontaneous combustion.

The thermal capacity of the furnaces for coal and ash handling has been taken to be larger than 45 kW but does not extend to the scale of major electricity generating board installations, the specification, design and operation of which is carried out by a substantial number of specialised engineers.

Brown coals and lignite with a lower calorific value (dry, ash-free basis) below 31 400 kJ/kg are not covered, as they are not being used in the UK at present, nor is the subject of processing of ash for further use, as opposed to ash disposal.

I was particularly impressed by the

layout of the book. It has been structured to provide advice and assistance in decisionmaking, while at the same time providing information about the aspects to be considered.

The appendices contain useful check lists on costing techniques and on coal and ash handling. There are also sections on the coals available to UK industrial consumers; coal definitions and quality information; conversion factors and other useful statistical data; plus a thorough and comprehensive annotated bibliography.

This is a comprehensive, systematic and authoritative publication containing new safety recommendations and providing a lot of advice that has not previously been available.

Andrew W Cox

Solar energy development — third programme

Series editor: W Palz

Vol 3, Photovoltaic Power Generation
Editors: R van Overstraeten and G Caratti

Vol 4, Solar Energy Applications to Buildings and Solar Radiation Data

Editor: T C Steemers

D Reidel Publishing, 1988

The photovoltaic power generation research and development programme of the Commission of the European Communities covers the period from 1985 to 1988 and has an overall budget of approximately 20 Mecu. One of the interesting features of these CEC programmes is that regular meetings of the participating contractors are held: Volume 3 gives the proceedings of the second contractors' meeting, held in Hamburg in September 1987.

Of the three main topics in the programme: amorphous silicon solar cells, thin film solar cells from alternative materials and photovoltaic pilot programmes — only the first two were discussed in this meeting.

The main thrust of the work on amorphous silicon solar cells has concentrated on the glow discharge and related techniques that have been identified as currently the most reliable and promising preparation methods for the manufacture of both single and multiple preparation methods for the manufacture of both single and multiple junction cells. Two large projects are being supported. This work includes two of Europe's leading amorphous silicon solar cell manufacturers and several major research institutions. The main partners in this collaboration are France, Germany and Italy. A few promising alternative deposition methods are also being supported. These techniques include the ionised cluster beam method and a novel Italian electrolytic process. No British work features in the 21 projects reviewed in this section.

Three different groups of materials have been identified as alternatives for thin-film solar cells. Five research groups, two from Italy and one each from Belgium, France and Spain, are working to develop 12% efficient thin-film solar cells on upgraded metallurgical grade silicon substrates. Among seven papers examining the use of II-VI and ternary chalcopyrite semiconductor materials are two from the UK: Prof Robert Hill's work on copper indium diselenide at Newcastle Polytechnic and the fabrication of mercyanine dyes for use as photovoltaic materials in a North London School. The Third group of nine papers cover work with gallium arsenide cells, again with no UK participant.

The work reported in Volume 4, *Solar energy applications to buildings and solar radiation data*, concentrates far more on applications rather than on fundamentals and there is a significant section on technology transfer. This section includes the project monitor brochures produced on the major European passive solar projects; the SOLINFO project (based in University College Dublin) aims to promote the transfer of information from the solar research community to the building and design professions, and the ARCHISOL project (also based in University College Dublin) that has the goal of advancing the introduction of energy conscious design into the mainstream of architectural design. Among the papers on solar radiation, work is described on the use of satellites to measure solar radiation, on earth, usability and cumulative frequency curves of solar irradiance, and European solar microclimates.

Both volumes list the names and addresses of all the participants, but, in common with many other CEC books, there is no index. Those who wish to find out what is happening in these subject areas within the European Community will find both volumes extremely informative.

Dr Cleland McVeigh

Recently published

Arab oil and gas directory

Available from the Arab Petroleum Research Centre, 7 Avenue Ingres, 75016 Paris, France.

Gas directory

Available from Benn Business Information Services, PO Box 20, Sovereign Way, Tonbridge, Kent TN9 1YZ. Price: £50.

Energy for the future

Price: £25.00
(£15.00 to members of the Institute of Energy).

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Orders with remittance to:
Dept PT
The Institute of Energy
18 Devonshire Street
London W1N 2AU

Another publication available from the Institute of Energy

Midland Branch
Symposium on
The future of Steam
(£25.00)

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Please send orders with remittance to:
Dept PT
The Institute of Energy
18 Devonshire Street
London W1N 2AU

NEMEX '88

Same again next year

The Institute of Energy was in association with the Energy Systems Trade Association (ESTA) for the successful revival of NEMEX, the National Energy Managers Exhibition.

The conference and exhibition were officially opened by Baroness Hooper, Under Secretary of State for Energy. She presented a £500 award, sponsored by the Contract Energy Management Group of ESTA, to Christopher Armes a student at Leeds University and a Student Member of the Institute, who prepared the winning paper on *Monitoring and targeting for energy use in the food industry* (see picture).

The first day of the conference was presented by experts in the energy

efficiency field. Controversial and topical issues were embraced, including the Government's likely future policy, the implications for both suppliers and users of a privatised energy supply industry, and the probable scenario for 1992 when the European Common Energy Policy comes into being.

The second day offered a choice of subjects, concentrating on energy efficiency technology, design, and practical aspects of implementation, and were of value to delegates expressing a first interest in the subject, as well as supplementing the knowledge of those already well acquainted with the possibilities for energy saving.

To round off the occasion, the EMSTAR reception and conference dinner were attended by around 450 people, and the NIFES/Powrmatic Energy Manager of the Year Award

was presented by Elliot Finer, Director General, Energy Efficiency Office, to Peter Lye, group energy manager, Littlewoods.

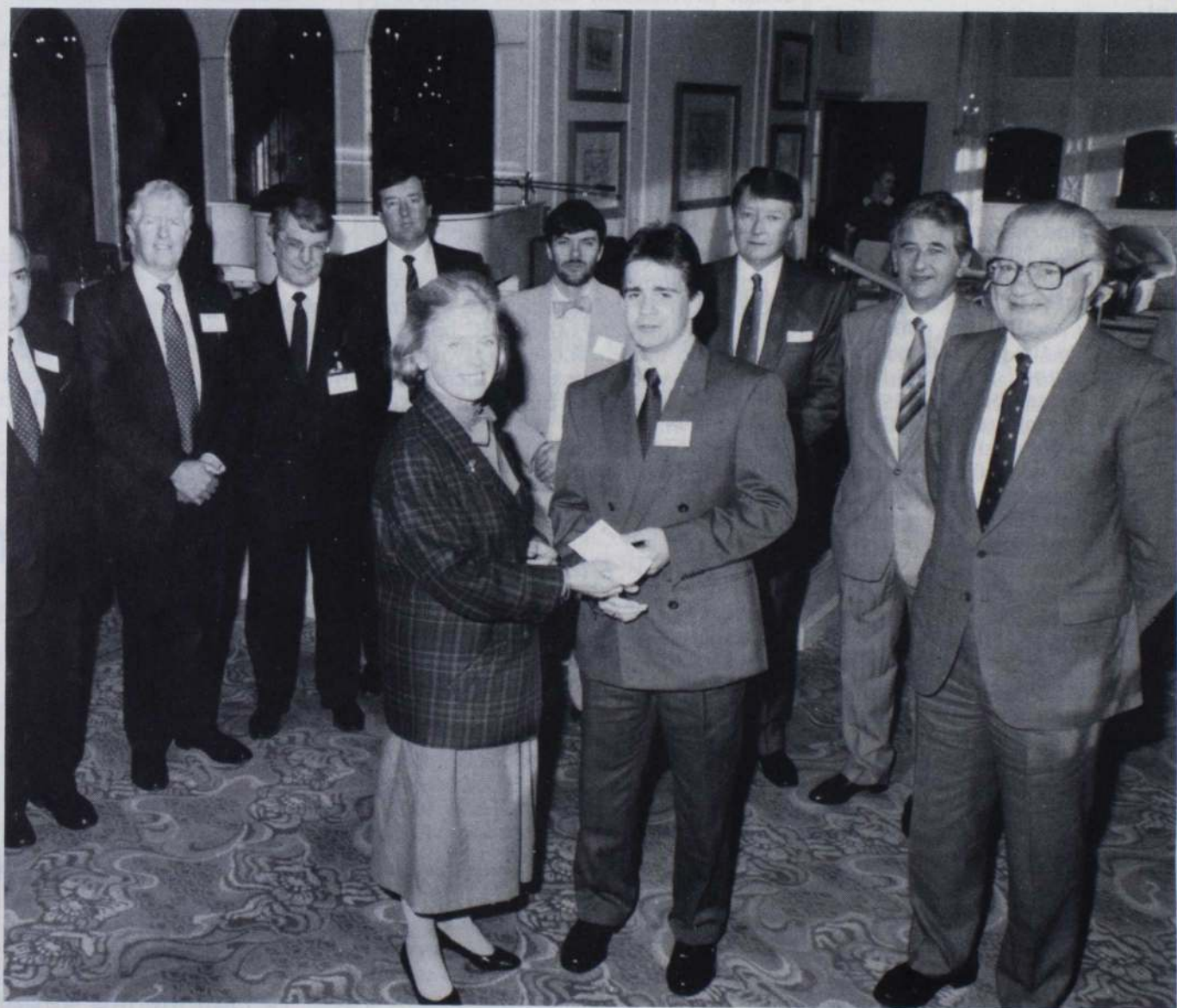
NEMEX '89 will be held on 21-22 November 1989.

Source: *Energy Systems Trade Association*

**Russian gas
For UK electricity**

It was reported in the *Financial Times* that an Anglo-American consortium was considering importing Soviet gas to generate electricity in southern England.

The group has had informal negotiations with the Soviet gas authorities and with other potential gas suppliers in Norway and Belgium.



Back row left to right: Brian Perry, Medetcrown; Norman Nicholson, PEAL; Brian Gibson, Resource & Utility Control; Alan Williams (Fellow) PEAL; C E Pugh CBE, president of Institute of Energy. Front Centre: Baroness Hooper, Under secretary of State for Energy; Christopher Armes, Leeds University Student and Award Winner

The gas would be used in a power station planned at Richborough, Kent — one of several recent proposals by private industry to meet electricity demand in southern England in the next decade.

It would be brought ashore in a new pipeline running from a terminal in the Netherlands, the first such scheme to link the UK into the Soviet gas supply network.

Source: *Financial Times*

Gas and oil control Association changes its name

The European Control Manufacturers' Association is grouping together the most important companies manufacturing, in Europe, control and regulating devices for all forms of energy.

The Association was founded in 1963 under the name of EGCMA (European Gas Control Manufacturers' Association). With the expansion of its activities the name was changed in 1968 to AFECOGAZ, although its field of activities covers also electricity as an energy source. However, at a recent general assembly the Association decided to be known from now on as AFECOR, as the previous name gave the impression that it was dealing with gas only.

The registered office is located, in accordance with the statutes, in the neighbourhood of Brussels (Vilvoorde). The secretary may be contacted in London, and the technical secretariat is located in Berlin.

Source: *AFECOR*

Oil and gas research New centre to open

The Institute for Petroleum Science and Technology is to be established in Edinburgh to mark the 25th anniversary of North Sea oil and gas operations. The new institute will be run by Heriot-Watt and Edinburgh universities and jointly funded by the oil industry and the Department of Energy.

The Institute's activities will concentrate on four key areas of petroleum exploitation: exploration, appraisal, development and production. The importance of safe, efficient and economic solutions will be fundamental to its work.

It will have an interdisciplinary structure, bringing together scientists and technologists from a wide variety of backgrounds. It will also seek to build collaborative links with other centres of petroleum research, including the establishment of joint research facilities and exchange teachers and students.

Source: *Department of Energy*

No to Hinkley Point C Yes to coal

Three potentially suitable sites in the Midlands, South Wales and Yorkshire have been identified by local authorities for a new cost effective coal-fired power station equipped with latest pollution controls as an alternative to the contested Hinkley, Somerset, nuclear power station project. A report from the Coalfield Communities Campaign (CCC) examines these sites at Hams Hall in Warwickshire, Uskmouth in Gwent, and Thorpe Marsh near Doncaster.

The report says that the costs of transmitting power from any of these sites are relatively minor and that no new power lines would need to be constructed from the North to the South. CCC also points out Hams Hall and Uskmouth are closer than Hinkley to the major concentration of electricity demand around London, while Thorpe Marsh is only slightly further away and has good existing national grid connections.

The report suggests that some 8100 jobs in the coal industry, dependent industries and services are at stake if the Hinkley nuclear power station rather than a coal-fired station is built. Also, there will be additional costs for treatment of radioactive waste and discharge from a new nuclear station.

Source: *Coalfield Communities Campaign*

Privatisation Missed opportunity?

The Government's approach to electricity privatisation will do little to improve the efficiency of Britain's ailing power stations, according to the Combined Heat and Power Association (CHPA). 'We are worried that some clauses of the Electricity Bill could effectively create no-go areas for private and municipal power generators,' CHPA director, David Green said.

According to the CHPA, the Government's Electricity Bill enables the new electricity distribution companies to slip out of their obligation to supply where a private (or municipal) power generator agrees to connect direct to individual homes, industrial sites, and even the Government's own buildings. The CHPA believes this will mean that in the future, back-up supplies to independently supplied consumers will only be available at a premium price, hence potentially penalising independent CHP operators through the excessive pricing of additional electricity supplies.

Greenhouse gas emissions in the UK could actually be cut by around 2-3% through a vigorous commitment to the

use of power stations that not only generate electricity, but also use the waste heat they inevitably create. At present, the association estimates, British power stations lose more energy than the entire annual output of the UK's North Sea Gas fields. David Green said, 'The Government cannot use the excuse of privatisation to totally sidestep its strategic responsibility for the efficient use of our energy resources. We have written to both the Department of Energy and the Department of Trade and Industry to seek some assurances on the specific direction of Government policy. We look forward to their replies.'

Source: *CHPA*

CHP For private power

A company in Chiswick*, London is to offer private combined heat and power (CHP) power plants to companies, free of charge. The heat and electricity generated will then be supplied at a discount to gas and electricity board prices.

The unit to be supplied is a 200 kW device, that has an extensive installed base in Norway. CHP is well accepted as a concept in Scandinavia because of the high cost of connecting widely geographically distributed communities to a national grid.

Robert Bull, the company's managing director, said that the biggest problem facing the introduction of CHP in the UK up to now has been the prospect of persuading customers to divert capital expenditure from other areas, 'by developing a package that enables them to use the technology and actually save money up front, we hope to make the technology attractive to a completely new range of customers.'

Source: *3i*

Energy production Down in 1988

Provisional statistics showing energy production and consumption in the three months September to November 1988 have been published.

Total inland energy consumption of primary fuels, which includes deliveries into consumption, during the three months September to November 1988 was equivalent to 85.1 Mt of coal, 4.6% more than in the corresponding period of 1987. Consumption of coal fell by 3.1%, whilst that of natural gas rose by 5.1%. Petroleum consumption increased by 8.2% and that of primary electricity by 22.5%. Total inland consumption in the year to date is up by one per cent.

Production of indigenous primary

*Combined Energy Projects

fuels in the three months September to November 1988, at 95.8 Mt of coal equivalent, was 4.6% lower than in the same months a year ago. Production of petroleum fell by 14.7%, whilst coal production, at 27.9 Mt, increased by 2.4%. Production of natural gas and primary electricity increased by 6.3% and 29.1% respectively. For the year to date, total energy production is 3.2% below last year.

Source: Department of Energy

Continuing education A new approach

A new approach to continuing education for engineers is being spearheaded by the Institution of Electrical Engineers (IEE). The scheme, *Continuing Education Modular Masters (CEMM)* provides intensive postgraduate courses in technology and related management studies.

Each two week module is hosted by a higher education institution. The courses are taught by experts from industry and academia. Students are free to select courses from different academic institutions, covering a wide range of subjects, so as to correspond to their individual career needs. Selected courses are typically studied at intervals over a few years so that the work involved is conveniently spaced. CEMM also offers students the option of working towards an eventual MSc qualification.

The new scheme offers important advantages, not only for engineers who want to update their knowledge, but also for employers who must prepare their staff for the technological challenges of the future.

Source: Institution of Electrical Engineers

Plutonium transport OK by air

The third report from the Advisory Committee on the Safe Transport of Radioactive Materials (ACTRAM), covering the transport of plutonium by air has been submitted jointly to Paul Channon, Secretary of State for Transport, and Dr E J Cullen, Chairman of the Health and Safety Commission.

The Committee concluded that the health risk arising from the transport of civil plutonium by air was extremely remote and acceptable. Their report allowed for the possibility of an increasing number of flights once British Nuclear Fuels' THORP reprocessing plant becomes operational in about five years' time. Despite this, ACTRAM concluded that the risk of a severe accident leading to a breach of the packaging and a release of plutonium dioxide was negligible, and the consequences should it ever occur, very limited.

The committee noted that the USA had issued requirements for the air transport of civil plutonium that were more demanding than the already stringent international regulations that govern the movements of most radioactive materials. In ACTRAM's view the disparity between the two sets of regulations needs to be reconciled. ACTRAM supports the review currently being undertaken by the IAEA of its safety regulations in this area and suggested that their report should be submitted to IAEA for consideration. Mr Channon has agreed to this.

Since ACTRAM submitted their findings there have been reports of a possible agreement by the US and Japanese Governments to return Japanese plutonium from Britain to Japan in the early 1990s by sea rather than air. The committee's report limits its consideration to safety rather than to strictly 'security' aspects of the transport of civil plutonium. It does, however, make it clear that, for sea transport, special security and escort arrangements would be necessary and that sea transport greatly increases the time taken.

Source: Department of Transport

International study of climate To be led by British scientist

Dr John Houghton, director of the Meteorological Office, will lead an international team reviewing scientific information on climate change. The team is one of three in a programme of work adopted at the first meeting held in Geneva of the International Panel on Climate Change (IPCC). The panel was set up by the World Meteorological Office (WMO) and the United Nations Environment Programme, (UNEP) in response to increasing concern over possible man-made climate change. Together with the two other working groups; one on the impact of climate change led by the USSR and one on response strategies led by the United States, Dr Houghton's team is to report back in mid-1990.

Commenting on his new assignment, Dr Houghton said: 'This will be an enormous task for the world scientific community, but vital if the work on impacts and responses is to have a sound base. Much has already been done but it is important to bring all this information together and to express more carefully the degree of uncertainty which exists in the forecasts of change.'

At the meeting the UK delegation, led by Dr Houghton, with Dr Fisk, the Department of Environment's chief scientist, reminded the panel that some actions to ameliorate climate change are already justified. Principal among these was the wide ratification and

strengthening of the Montreal Protocol on CFC's (10 000 times more effective as a greenhouse gas than carbon dioxide), proper pricing of energy sources to encourage renewable energy sources and energy efficiency, and better land use practice to control deforestation.

Source: Department of the Environment

Argentina \$252 M for electric power

A \$252 M loan from the *World Bank* will support an electric power programme that aims to expand the sector by using least-cost measures and rehabilitate the finances of the national power utilities, and promote more rational use of electricity through a tariff system based on costs.

About \$250 M of the loan will help fund the 1988-89 schedule of the sectoral investment programme to speed up construction of the Yacyreta binational (Argentina-Paraguay) hydroelectric project, the most pressing need of the sector. The remaining \$2 M will be used to strengthen the Energy Secretariat.

The Yacyreta project, for which the World Bank had approved a loan of \$210 M in October 1979, has suffered an eight-year implementation delay. After appointing a new management team, the Argentine government carefully considered the implementation options and decided to complete the project.

Progress in construction has been satisfactory during the last three years and it is expected that the first units of Yacyreta will be under production tests by the second half of 1992.

Completion of the project is the least-cost option for expanding national power generation facilities. In the Yacyreta case, the investment that would be required to replace it with thermal plants is greater than that needed for completion.

Source: World Bank News

PFBC/Gasification Hybrid plant developed

Coal gasification and fluidised bed combustion are two of the most promising technologies for the electric power station of the future. A third option may be a plant that incorporates the best features of both. This hybrid power system is the subject of a new \$1.1 M US Department of Energy contract awarded to the M W Kellogg Company of Houston.

A power system that will use both

a coal gasifier and a pressurised fluidised bed coal combustor to drive a gas turbine-generator to produce electricity will be designed. The concept relies on a high speed transport process that sweeps coal rapidly, in a circulating motion, though the gasifier-combustor combination.

It is thought that the dual configuration might cut the cost of electricity by at least 20%. The lower power costs would come from a substantial boost in power generating efficiency. The performance boost is achieved because more of the coal's heat energy is channelled directly into a higher-efficiency gas turbine instead of a steam turbine.

Conventional plants heat water to form steam, which is then used to turn a steam turbine. Similarly, the first plants employing the more advanced pressurised fluidised bed combustion process will also rely on a steam turbine to generate the bulk of the plant's electric power. Because heat is lost during the steam producing process, the steam cycle is inherently less efficient than using the hot gases directly in a gas turbine.

From a mechanical sense, the two vessels at the heart of the design operate very similarly, but each performs a distinctly different function. One is a type of gasifier that converts only part of the coal into a gas. Although low in Btu heat value, the gas is combustible, and after cleaning, it would be sent to the gas turbine to be burned to produce power.

The coal that remains is in the form of char, also a combustible material. The char is transported to a second vessel, the pressurised fluidised bed combustor, where it is burned to produce a second source of hot gas for the gas turbine. The two main vessels used in the system are relatively small and are less costly than the high pressure vessels envisioned for initial pressurised fluidised bed plants.

Source: US Department of Energy

Domestic electricity use

To be monitored at home

A new computerised metering system that, at the press of a button, can tell householders how much electricity they have used and what it has cost them is being put on trial in more than 100 homes in Hove, East Sussex.

The 18-month trial of the energy management unit will also help the electricity board find out how the average family will react to a revolutionary new scheme in which the cost of electricity changes at different times of the day.

Volunteer customers were chosen at random to take part in the trial but their selection was based mainly on how much electricity they use daily. Those taking part range from retired couples to families with young children.

A display unit, resembling a large calculator, usually placed in the hall or kitchen will give the householders:

■ A greater understanding of how they use electricity.

■ A guide on how much their home appliances cost to run.

■ Help with the housekeeping by estimating the quarterly bill.

■ A comparison with their last electricity bill.

■ A chance to save money with special cheaper electricity prices.

It is hoped that the unit will help householders understand more about the amount of electricity they use in their homes, at what time of day they use it most and how, by changing their use pattern, they could save themselves money.

Source: South Eastern Electricity Board

Renewable energy DOE project under way

Energy Minister Baroness Hooper has announced that the North-West Electricity Board is to undertake a study in collaboration with the Department of Energy's Energy Technology Support Unit to assess the potential for electricity generation from renewable energy sources connected to its distribution system.

The study will examine the possibilities from wind, biofuels, geothermal, hydro, wave and tidal energy. It will also examine the interaction effects between these sources and their interaction with the distribution company system.

Baroness Hooper said: 'If this study shows economic potential, which I am sure it will, then further more specific studies will need to be undertaken with a view to developing specific proposals for individual plants. This is the first major study that I am aware of and I hope it will pave the way for other distribution companies to follow. I would like to congratulate NORWEB on this initiative'.

Source: Department of Energy

Hydropower In China

A Canadian consortium has recently been awarded a major contract for the Geheyan hydroelectric plant.

The Geheyan hydroelectric plant will be the first power station to be constructed on the Quingjiang River, a tributary of the Yangtze. It will have four generating units, each rated at 340 MW. The first unit will enter service in 1992.

Source: ASEA Brown Boveri

Don't go without saying goodbye!

Every year we lose some of our members. Just sometimes, years later, we do hear from a lost member, wanting to re-establish status as a Chartered Engineer. Sadly, it may be too late. The hard-won qualifications of yesteryear may no longer meet the requirements of the Engineering Council.

So, if you are retiring, moving house, going abroad, changing employment — drop us a line!

1989 spring meetings

If full details are not given below please contact the branch honorary secretary.

East Midlands

Honorary secretary: J R Agg, tel: (0533) 549414 ext 2037.

Mar. Joint meeting with the Coal Industry Society at Eastwood Hall. Further details from the honorary secretary.

Mar/Apr. *Flue-gas desulphurisation.* Presentation and station visit at CEGB Radcliffe on Soar, Nottingham at 1400 h.

14 Apr (F). Annual dinner at the George Hotel, Nottingham.

26 Apr (W). AGM at Coalite Group, Bolsover.

Midland

Honorary secretary: A W T Cleaver, tel: (0902) 753806.

2 Mar (Th). *Combustion optimisation and troubleshooting* by J F Brazier in the Senior Common Room, University of Aston in Birmingham at 1900 h.

25 Apr (Tu). Jim Ellis Memorial Lecture — *Gas: offshore to the West Midlands market* by Cedric Brown, director of Exploration and Production, British Gas. The Birmingham Room, British Gas, Wharf Lane, Solihull at 1100 for 1130 h. See Special Announcements on p 00.

6 Apr (Th). *Fire — unwanted combustion* by Prof K N Palmer at the above venue at 1900 h.

4 May (Th). AGM and works visit. Ind Coope, Burton on Trent.

Scottish

Honorary secretary: J McColl, tel: 041-332 2453.

7 Mar (Tu). Lecture to be given by Andrew Warren of the Association for the Conservation of Energy. This is a joint meeting of the Institution of Petroleum Engineers to be held at the Royal Scottish Automobile Club, Blythswood Square, Glasgow at 1800 for 1830 h.

12 Apr (W). Annual dinner. The speaker will be Gavin Laird, general secretary, AEU. Venue as above.

Yorkshire

Honorary secretary: A Mallalieu, tel: (0532) 711888 ext 230.

14 Mar (Tu). *Coal liquefaction — bridging the gulf in the 21st century* by Geoff Kimber, technical manager, Point of Ayr. Joint meeting with the Institute of Petroleum at the Mansion Hotel, Roundhay, Leeds at 1930 h.

18 Mar (Sa). Annual dinner and dance at the Cairn Hotel, Harrogate at 1915 for 1945.

5 Apr (W). *Alternative energy — blowing in the wind* by Joseph Dickenson at J & E Dickenson, Upper Longley Farm, Holmfirth, Nr Huddersfield. After the talk there will be a tour of Longley Farm; numbers will be limited and you are asked to contact the honorary secretary for tickets beforehand. 1400 for 1430 h.

26 Apr (W). AGM at AHED House, Ossett at 1400 for 1430 h.

North Western

Honorary secretary: D Callander tel: (0204) 71992.

16 Mar (Th). The ICI Lecture: *Making it happen — a pro-active energy policy* at the Winnington Works at 1400 h.

20 Apr (Th). AGM in the private suite, University House, University of Salford at 1700 for 1730 h.

19 May (F). Chairman's visit. Point of Ayr Liquefaction Plant.

South Wales and West of England

Honorary secretary: G B Spiller, tel: (0272) 731461.

16 Mar (Th). Tour of Harveys Wine Museum and Cellars, Denmark St, Bristol at 1830 h. Tickets by application to the honorary secretary.

26 Apr (W). AGM followed by the chairman's address.

5 May (F). *The future of international coal and its impact on the British coal industry* by G McCloskey, *Financial Times* at the Coal Research Establishment, Stoke Orchard, Cheltenham at 1215 h. Tickets and further information from Barry Woods, telephone (0242) 673361.

South Coast

Honorary secretary: Dr M R I Purvis, tel (0705) 827681.

22 Mar (W). AGM at the Theatre Royal, Southsea at 1915 h. The AGM will be followed by a tour of Edwardian theatre. Refreshments will be available.

NEMEX '88

The Institute of Energy was in association with the Energy Systems Trade Association for NEMEX '88, held at the Metropole Hotel, Birmingham on 6-7 December 1988. The Institute of Energy's exhibition stand was well attended



and the above picture shows, from left to right, Colin Rigg (secretary, Institute of Energy), Judith Higgins (conference manager, Institute of Energy), C E Pugh CBE (president, Institute of Energy), Baroness Hooper (Under Secretary of State for Energy), H Etherington (Fellow) and A W T Cleaver (Fellow and honorary secretary of the Midland Branch of the Institute of Energy) standing in front of the Institute's stand. See Political and Economic, p 10 for a fuller report of the event.

Merseyside

Honorary secretary: D G Connell, tel: 051-708 9469 ext 11.

12 Apr (W). AGM at the Feathers Hotel, Mount Pleasant, Liverpool at 1830 h.

North Eastern

Honorary secretary: Dr A W Cox, tel: 091-261 5274.

10 May (W). AGM at Phillips Components Television Factory, Belmont Industrial Estate, Durham.

Obituary

It was with deep regret that we learned of the sudden death of **Edward Blacker** (Member) on 16 August 1988.

Eddie was a past chairman (1986-1987) and committee member of the Scottish Branch of the Institute of Energy. He served his student apprenticeship in building services engineering with G N Haden, Glasgow. After holding senior engineering posts with Oscar Faber and DSSR he joined Glasgow Corporation and subsequently Strathclyde Regional Council where he held the post of team leader.

He was a member of the Institution of Mechanical Engineers and served as a member of the council of the Institution of Chartered Building Services Engineers.

Throughout his life Eddie was kind and thoughtful to others. He would always find time to give guidance to young members of the Institute or indeed to any young engineer just starting out on their career.

He will be greatly missed and our deepest sympathies are extended to his wife, Margaret and her two daughters, Catherine and Suzanne.

W M F Mackenzie

Midland branch

Mrs Muriel Ellis donates a new chain of office to the chairman of the Midland branch, Jeff Masters. This was in memory of her late husband Jim Ellis, who was an enthusiastic supporter of the Midland branch, and a dedicated worker, serving in all capacities as a



committee member over a period of 20 years, as well as chairing the Institute of Energy's Membership Committee. He was much liked and respected and the chain of office will stand as a lasting tribute.

In addition a new event, the Jim Ellis Memorial Lecture, will be given each year. This will be a lunchtime event, hosted by the chairman in office's organisation. The inaugural lecture will be given by Cedric Brown, previously manager of the Morecambe Bay Gas Field Project.

Personal

Prof J M Beér (Senior Fellow) has been awarded the Percy Nicholls Award of the American Society of Mechanical Engineers and the American Institute of Mining, Metallurgical and Petroleum Engineers in recognition of outstanding achievement in the field of solid fuel science and technology. Earlier, Prof Beér, professor of chemical engineering and scientific director of the Massachusetts Institute of Technology, gave the Hoyt C Hoteel plenary lecture of the International Combustion Symposium in Seattle, Washington.

J Porteous (Fellow), chairman of the Yorkshire Electricity Board has been appointed chairman-designate of the proposed privatised electricity supply company for the Yorkshire region.

Mrs R K Thorley (Member) has been appointed energy information officer for the City of Leicester.

Dr O Ta'eed (Graduate Member) was joint winner, Industrial Section, of the 'Make it in stainless' competition. Dr Ta'eed won the prize for the design of a high performance stainless steel membrane filter.

LIST OF MEMBERS - 1988

Due to a typographical error, the List of Members for 1988 does not contain any titles (Dr, Sir, Prof, etc) in the body of the text.

The Institute wishes to apologise for this omission.

Accessing Energyline

The Institute is now able to offer to members an on-line database search facility, accessing Energyline; a worldwide bibliographic database covering energy topics, including research policy and current energy news.

Using one of our microcomputers, Institute staff will search on-line, using the specific keywords provided by the member concerned.

The basic fee for this service is £25 (inclusive of VAT), but the Institute will have to charge more for lengthy searches.

Responsibility for obtaining the actual reference material itself (from places such as the British Library) will of course remain that of the member.

For further information on this service please telephone Christine McCarthy on 01-580 7124.

55th Melchett Lecture: Royal Institution, London, 1 March 1989

The 55th Melchett Lecture of the Institute of Energy will be given by L N Chamberlain, chief executive, British Nuclear Fuels. Mr Chamberlain will speak on *Nuclear fuel: the thinking man's alternative* at the Royal Institution of Great Britain, 21 Albemarle Street, London W1. There will be tea at 1730 h and the lecture will begin at 1800 h.

Jim Ellis Memorial Lecture: 25 April 1989

The Midland Branch of the Institute of Energy will be holding the inaugural Jim Ellis Memorial Lecture on 25 April 1989 in the Birmingham Room, British Gas West Midlands, Wharf Lane, Solihull at 1130 h. Cedric Brown, director of Exploration and Production, British Gas, will speak on *Gas: offshore to the West Midlands market*.

Coffee will be served before the lecture at 1100 h and there will be a luncheon afterwards. Admission to the lecture is free but will be by ticket only; those wishing to attend should contact the branch chairman, Jeff Masters on 021-705 7581. Lunch will cost £7.50 (includes sherry and wine). Tickets for the lunch may be obtained by sending a cheque, payable to the Institute of Energy, Midlands Branch, to Jeff Masters, Assistant Director, British Gas, Midlands Research Station, Wharf Lane, Solihull, West Midlands B91 2JW.

New Year Honours

We congratulate the following whose names appeared in the New Year Honours List:

CBE

J G Anderson (Fellow), executive deputy chairman, Northern Engineering Industries.

Dr F Fitzgerald (Fellow), managing director, technical, British Steel.

OBE

D W Roberts (Member), principal engineer, Sir William Halcrow & Partners.

D Green (Member). Mr Green was awarded the OBE in the 1987 Queens Birthday Honours. He worked in the electricity supply industry until his retirement last year.

Imperial Service Order

G A Paul-Clark (Member), senior chief examiner, Department of Energy.

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

Book aid — help the Third World

The International Committee of the Institute of Energy has been considering ways in which the Institute can assist the developing countries, and has decided that one measure in which the membership at large can participate is the supply of technical and scientific books and journals.

One scheme was initiated in 1986 and many members made generous donations of books and journals. Unfortunately that independent operation ran into difficulties in arranging transport to overseas destinations. The responses received to that effort, particularly from Tanzania, have convinced the International Committee that it should be resuscitated. This time it is intended that the Institute will participate in the established Book Aid Programme, operated by Ranfurly Library Services (RLS).

After 30 years of development, this voluntary programme is now distributing more than a half a million donated books a year. There is a particular need for technical and scientific books in higher education institutions; they should be in good condition, preferably dated after 1975 and in SI units, though earlier textbooks of recognised standing are still useful.

RLS arranges the package and despatch of books from its HQ in South London. Collection and transport to London is usually possible through the good offices of Rotary Club members. An effective involvement by the Institute would require just a few volunteers in each of the branches to organise a local collection of surplus books on a regular basis, say once a year. Some temporary storage space would be needed. The committee hopes that, in view of the destination of the books, members in higher education institutions will offer to act as local co-ordinators and to arrange a temporary storage.

Members willing to help in getting the scheme started should send a note of their names, addresses and branches to the chairman, International Committee, Institute of Energy, 18 Devonshire St, London W1N 2AU.

Revised training guidelines

Members will be aware (*Energy World*, March 1987) that the Institute has set up a Training Accreditation Panel. Its remit includes establishing training guidelines to meet the membership requirements of the Institute and advising individuals and employing organisations on how they might be met. The panel has now revised the Institute's training requirements for corporate membership.

In carrying out this work the panel aimed to introduce more flexibility and to make them attractive to smaller

Cooling down nuclear power

Continued from page 6

treatment. New, and possibly more effective, techniques will be developed and integrated into those which are currently being used. The decommissioning of a nuclear power station is mainly a change in the scale of what has been achieved to date. The social, political and financial aspects will continue to loom large on the decommissioning scene and probably influence it as much as technological development.

It is clear that decommissioning of nuclear facilities will provide the nuclear/demolition industry with an opportunity to develop interesting commercial enterprises in the not too distant future.

companies and organisations while maintaining adequate standards. The new emphasis is on achieving standards and quality of training by calling for professional level supervision during training. Similarly it is hoped that the greater flexibility will enable graduates working in small companies to meet the training requirements for corporate membership. The Institute is keen to attract more young people into membership and for companies and individuals to submit their training schemes for approval.

Both the new training requirements and guidance on the preparation and submission of training schemes for graduates can be obtained from Christine MacCarthy, Education Secretary, on 01-580 0077.

Advances in Particulate Technology April 15-17 1991 — call for papers

This symposium will focus on industrial applications of particulate technology with particular reference to:

- *Particulate formation*, with the accent on the control of particle morphology.
- *Solid liquid phenomena* — including suspension rheology and novel solid/liquid deposition.
- *Handling and processing of dry solids at high particle concentration*.
- *Aerosols*, formation and processing.
- *Relationships between microscopic phenomena and macroscopic properties*.

It is expected that some 30 papers will be presented in the course of the three days. All papers will be refereed and published in a special edition of *Power Technology*. UK and overseas papers are welcome and anyone wishing to contribute should send a title and brief synopsis to reach the organisers by 1 September 1989, for the attention of: Prof R Clift, Dept of Chemical and Process Engineering, University of Surrey, Guildford, Surrey GU2 5XH.

World Renewable Energy Congress 23-28 September 1990 — Call for papers

The World Renewable Energy Congress, to be held in Reading, Berkshire on 23-28 September 1990, will cover: photovoltaic conversion, solar thermal applications, biomass conversion, wind energy, material science, passive and low energy architecture and other related energy topics. The role of renewable energy in the developing world will be given special emphasis.

Abstracts of not more than 500 words should be sent to Prof A A M Sayigh, Chairman of the Congress, Department of Engineering, University of Reading, Whiteknights, PO Box 225, Reading RG6 2AY. The subject area covered by the abstract should be mentioned in the covering letter to enable the organisers to classify submissions. Submissions should arrive in Reading not later than 30 September 1989.

Overseas Research Student Awards 1989

850 Overseas Research Student Awards will be offered on a competitive basis in 1989 to overseas postgraduate students of outstanding merit and research potential. Each award will cover the difference between the tuition fee for a home (UK) postgraduate student and the fee chargeable to an overseas postgraduate student.

Awardholders will be overseas graduate students who, in session 1989-90, are commencing full-time study for a higher degree as registered research students at one of the listed academic institutions, or who are already undertaking such a course and do not have an ORS Award. They must be liable to pay tuition fees at the rate for overseas students.

The only criteria for the awards are outstanding merit and research potential; other factors such as means, nationality, proposed field and institution of study, will not be taken into account. The awards may be held in any field of study.

Subject to the satisfactory progress of the awardholder, awards will be renewed for a second or a third year according to the normal or remaining length of the research course being undertaken.

The scheme is administered by the Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom. A special committee, composed of senior members of academic staff of academic institutions, is responsible for the selection of awardholders, and for the detailed management of the scheme.

Further details and application forms can be obtained from: ORS Awards Scheme, Committee of Vice-Chancellors and Principals, 29 Tavistock Square, London WC1H 9EZ.

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The Energy Industries Club

The Energy Industries Club is a private luncheon club at which addresses are given by prominent members in the energy and associated industries.

Members of the Institute of Energy who are not members of the Energy Industries Club are entitled to attend one luncheon meeting at the luncheon price only, with the option of joining the Club for subsequent meetings, at the membership rate. For more information contact Dr G G Thurlow on 06845 4481.

REGISTER OF ENERGY COURSES

Course No 00-472

Title: Control system integration.
Duration: 1 day.
Location: CIBSE, London.
Starting: 16 March 1989.
Content: Control principles and regimes. Simple theory and applications. Control systems components, optimisers, compensators. Control characteristics. Matching HVAC systems and their controls.

Course No 00-473

Title: Introduction to oilfield exploration and production.
Duration: 3 days.
Location: Oxford.
Starting: 20 March 1989.
Content: Concepts of petroleum geology, geophysical surveying, drilling and exploration well and the production facilities needed to handle crude oil and gas and its transportation.

Course No 00-478

Title: Process facilities for handling oil and natural gas.
Duration: 3 days.
Location: Oxford.
Starting: 28 March 1989.
Content: An understanding of the nature and behaviour of hydrocarbons and of the main processing facilities necessary to provide crude oil and gas of suitable specification for transport and delivery. The functions and operations of key process units.

Course No 00-470

Title: Solid-liquid separation.
Duration: 4 days.
Location: University of Bradford.
Starting: 3 April 1989.
Content: Review of the basic principles, fundamentals of particle-fluid interaction. Coagulation and flocculation. Efficiency of separation, combinations of separators in series. Deep bed filtration. Pressure filters. Fundamentals of cake filtration. Magnetic separation. Centrifuges. Vacuum filters. Methods of limiting cake growth. Membrane filtration. Flotation. Screening. Filter media.

Course No 00-474

Title: Petroleum prospect evaluation and development planning.
Duration: 5 days.
Location: Oxford.
Starting: 3 April 1989.
Content: Risks and uncertainties associated with the evaluation of a reservoir.

Course No 00-466

Title: Introduction to air conditioning and refrigeration.
Duration: 5 days.
Location: South Bank Polytechnic, London.
Starting: 10 April 1989.
Content: An introduction to the fundamentals of air conditioning and refrigeration. An overview of the different types of system employed in modern buildings in the UK.

Course No 00-471

Title: Hydrocyclones.
Duration: 3 days.
Location: University of Bradford.
Starting: 10 April 1989.
Content: Elements of particle-fluid interaction. Efficiency of separation, testing and evaluation. Fluid flow and particle motion in a hydrocyclone, types of hydrocyclones available. Installation and operation of hydrocyclones, operating characteristics. The effects of design variables and internal finish. Theories of separation. Hydrocyclone selection and scale-up. Hydrocyclones for liquid-liquid separation. Degassing of liquids with hydrocyclones. Combinations of hydrocyclones in series and with other separators. Applications, economics and safety. Sorting of solids according to density with hydrocyclones.

Course No 00-479

Title: Production economics.
Duration: 5 days.
Location: Oxford.
Starting: 10 April 1989.
Content: The basic tools and methods of economic appraisal. An engineering approach to production economics.

Course No 00-475

Title: Government and the oil industry: relationships and regulations.
Duration: 5 days.
Location: Oxford.
Starting: 17 April 1989.
Content: The framework of international law affecting the exploration for and development of oil and gas resources and the historical development of concessions, licences, participation agreements and production sharing contracts.

Course No 00-476

Title: Joint interest ventures for oilfield operations.
Duration: 3 days.
Location: Oxford.
Starting: 24 April 1989.
Content: An understanding of the law and practice applying to joint interest operations.

Course No 00-477

Title: Negotiations workshop.
Duration: 2 days.
Location: Oxford.
Starting: 27 April 1989.
Content: Negotiating process. Negotiating situations.

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CONFERENCES

The following conferences, and exhibitions are organised by bodies other than the Institute of Energy. For Institute conferences please see inside front cover.

March 1989

Safety and reliability objectives in high technology and industry
Conference, Amsterdam, 2-3 March 1989.

Details from: Katie Lye, IBC Technical Services, Bath House (3rd floor), 56 Holborn Viaduct, London EC1A 2EX.

Conservation of engineering structures

Conference, London (Royal Institute of British Architects), 13 March 1989.
Details from: Conference Office, Institution of Civil Engineers, 1-7 Great George Street, London SW1P 3AA.
Tel: 01-222 7722.

Combustion and environment

Joint Flame Day meeting, Sirmione, Italy, 15-17 March 1989.
Details from: Roger Pinatel, Elf France, Place de la Coupole, Cedex 45, 92078 France. Tel: Int + 33 1 47 44 22 33, tlx: 615400 ELFA F, fax: Int + 33 1 47 32 33.

April 1989

Flowmeter selection, calibration and application

Course, London (Portman Intercontinental Hotel), 6-7 April 1989.
Details from: Carol Gerrard, IBC Technical Services, Bath House, 56 Holborn Viaduct, London EC1A 2EX.
Tel: 01-236 4080.

5th Battery seminar and exhibition

London (Ramada Inn), 11 April 1989.
Details from: Miss Laura Christie, principal seminar organiser, ERA Technology, Cleeve Road, Leatherhead, Surrey KT22 7SA. Tel: (0372) 374151 ext 2290 or 2488, tlx: 264045 ERALHD G, fax: (0372) 374496.

Oil symposium

Second Rotterdam oil symposium, Rotterdam, 12-13 April 1989.
Details from: Conference Office, PO Box 29882, 2502 LV The Hague, The Netherlands. Tel: Int + 70 546811, tlx: 31440 vng nl, fax: Int + 70 512777.

DIAGENG '89

Conference, Leicester, 12-13 April 1989.

Details from: Conference Office, Institution of Diagnostic Engineers, 5 Wycliffe Street, Leicester LE1 5LR.
Tel: (053) 7592552, tlx: 341401.

May 1989

Power symposium

32nd ISA Power Symposium, Phoenix, Arizona, 22-24 May 1989.
Details from: William T Blazier, POWID National Publicity Chairman, Instrument Society of America, 67 Alexander Drive, PO Box 12277, Research Triangle Park, NC 27709, USA. Tel: INT+919 549 8411. tlx: 802-540.

South East Asia iron and steel

33rd SEAISI conference, Seoul, Korea, 29-31 May 1989.
Details from: The Secretary General, SEAISI, PO Box 7759, Airmail Distribution Centre, Ninoy Aquino International Airport, Pasay City, 1300 Philippines. Tel: Int + 6732161.

June 1989

Combustion Engines

18th international congress, Tianjin, China, 5-8 June 1989.
Details from: Mrs U Herring or Mr R Davies, British National Committee of CIMAC, Forbes House, Halkin Street, London SW1X 7DS. Tel: 01-235 7000, tlx: 21628.

July 1989

Calibration of temperature and pressure measurement instruments

Course, Portsmouth Polytechnic, 10-21 July 1989.
Details from: Dr Mike Purvis, Dept Mechanical Engineering, Portsmouth Polytechnic, Anglesea Building, Anglesea Road, Portsmouth PO1 3DJ. Tel: (0705) 827681.

Gas cleaning at high temperatures

Course, University of Surrey, 11-12 July 1989.
Details from: Mrs Jean Liabaert, Dept Chemical and Process Engineering, University of Surrey, Guildford GU2 5XH. Tel: (0483) 506330.

September 1989

Offshore Europe '89

Conference, Aberdeen, 5-8 September 1989.
Details from: Lesley Ann Sandbach, Offshore Europe (Management), Rowe House, 55-59 Fife Road, Kingston upon Thames, Surrey KT1 1TA. Tel: 01-541 5831, tlx: 928042 SPEARS G, fax: 01-541 5657.

Asia Pacific Petroleum

Conference, Singapore, 11-13 September 1989.
Details from: Times Conferences, 19 Tanglin Road, Tanglin Shopping Centre, Singapore 1024. Tel: Int + 7349385. tlx: RS40113 ATT, fax: Int + 7379027.

Clean air

Congress and exhibition, The Hague, The Netherlands, 11-15 September 1989.
Details from: Clean Air Society in The Netherlands. PO Box 186, 2600 AD Delft, The Netherlands.

Furnaces in Asia

Conference and exhibition, Hong Kong, 12-14 September 1989.
Details from: Ray Morris, Furnaces Asia '89 Queensway House, 2 Queensway, Redhill, Surrey RH1 1QS. Tel: (0737) 768611.

Energy management

Course, Portsmouth Polytechnic, 18-22 September 1989.
Details from: Dr Mike Purvis, Dept Mechanical Engineering, Portsmouth Polytechnic, Anglesea Building, Anglesea Road, Portsmouth PO1 3DJ. Tel: (0705) 827681.

Agglomeration

Symposium, Brighton, 25-27 September 1989.
Details from: Mrs L N Curzon, Conference Section, Institution of Chemical Engineers, 165-171 Railway Terrace, Rugby CV21 3HQ. Tel: (0788) 78214, tlx: 311780, fax: (0788) 60833.

Coal

Conference, Pittsburgh, USA, 25-29 September 1989.
Details from: Pittsburgh Coal Conference, MEMS, One Northgate Square, 2 Garden Centre Drive, Suite 211, PO Box 270, Greensburg, Pennsylvania 15601 USA. Tel: Int + 412 836 6813, fax: Int + 412 836 6817.

Electric steam boilers

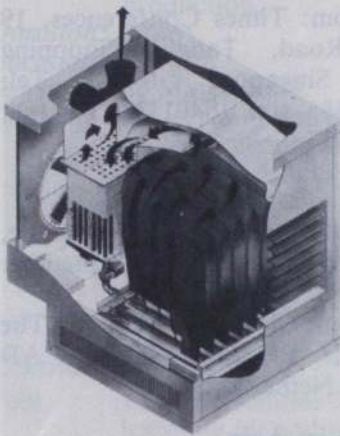
Eltron has introduced a range of industrial electric steam boilers, steam generators and controls. The standard range comprises units capable of delivering from nine to 543 lbs of steam/h, with a kW rating from three to 180, with psig from 0 to 150. Larger capacity boilers (up to 4883 lbs/h, 1620 kW and 300 psig) are also available.

Reader enquiry no 1/1

Tough new heater

A suspended, gas-fired, semi-condensing warm air heater has been added to the **Powmatic** PGUH range.

Rated at 44 to 59 kW (150 000-200 000 Btu/h), the new model, PGUH/HE 200, has an operating



Semi-conducting, suspended warm-air heater

efficiency in excess of 95% on net CV. This has been made possible by the incorporation of a secondary finned aluminium tube heat exchanger (see picture).

Fitted with automatic ignition and ducted combustion air inlet as standard, the heater also features the option to duct in combustion air from outside. This enables the unit to be sited in 'aggressive' environments, the combustion air being drawn into the heater combustion chamber through a concentric air duct around the flue pipe.

Reader enquiry no 1/2

Chillers and heat pumps

Two new ranges of **CIATCOOLER**, water-cooled chillers and **THERMACIAT**, water to water heat pumps have been introduced by **CIAT**. Designed for air conditioning, industrial refrigeration and heat recovery, both ranges are fitted with screw compressors, and are extremely compact machines. Advantages of screw compressors are particularly low levels of noise and vibration, coupled with a long service life and a minimal maintenance requirement.

The low noise and vibration levels can be particularly important in chillers designed for location in internal plant rooms. Both ranges

are available with remote air-cooled condensers, if required, and double condensers for heat recovery are also an option. Temperatures down to -15°C are achievable by chillers operating with glycol.

The LV range of **CIATCOOLER** chillers has from one to three twin screw semi-hermetic or open-type compressors. The capacity of each unit is controlled by speed variation and/or the number of compressors in operation, with two, three or four stages available, depending upon the unit. The condenser and evaporator are steel and copper shell and tube type. Nominal cooling capacity of the LV range is from 100 to 600 kW.

CIATCOOLER LBI chillers are fitted with one single screw open type compressor. Capacity control is stepless from 10% to 100%, with visual indication of the percentage. Nominal cooling capacity of the range is from 250 kW to 2400 kW.

Reader enquiry no 1/3

Electric drying

Meltech Furnaces have supplied four forced circulation ovens to the **Critchley Sharp** and **Tetlow** steel wire plant at **Cleckheaton**, West Yorkshire.

The electric ovens replace a gas fired drying unit, and are used to dry lubricants and associated borax coatings applied to the wire prior to drawing. The manufacturers list the ovens advantages as: significantly reduced baking times, reduction in die wear, energy savings in excess of 90%, and a lower reject rate giving total overall productivity savings of around 67%. The increase in the efficiency of heat transfer has also eliminated the need to turn the coils of wire during the drying cycle.

The power input to the ovens is approximately 25 kW to maintain the optimum temperature of 130°C . PID (proportional, integral and derivative) control systems hold the temperature within 5°C . Each oven is designed to give a maximum continuous operating temperature of 250°C .

Reader enquiry no 1/4

Energy analysis

Elcomponent has introduced a multi-function energy monitoring system called **VIP System 3**.

Designed to provide analysis for three phase systems, the PC-composite **VIP** system and the **VIP 3** will measure, record and store as many as 82 different electrical parameters and incorporate a high resolution 'supertwist' LCD display plus built-in printer/plotter facilities.

In addition to measuring such instantaneous values as voltage, current, active/reactive/apparent power, power factor, frequency, and waveform distortion, the instrument can offer readings of average values over a preset inte-

gration period and will also record maximum power and distortion figures. It is also capable of measuring active and reactive energy consumption in five different time cycles — with both separate or total integration.

The system can be fitted with a memory pack that can be used to program and carry out user-specific surveys with an option of data transfer to a host computer or a remote printer using serial **RS 232**. The system can be further expanded using 'black boxes' that permit monitoring and analysis of temperature, leakage and so on.

Reader enquiry no 1/5

Expert building management

Logica is to develop an expert system as part of a **Building Research Establishment (BRE)** research programme designed to make the use of building management systems more cost effective and therefore more attractive to a wider range of organisations.

Building management systems currently require highly skilled technicians to monitor the performance of building services to help maintain acceptable working environments. The expert system to be developed will incorporate some of the expertise of senior engineers so that building management systems can be used more widely by less experienced staff.

The system, known as **BREX-BAS**, is designed to operate alongside building management systems on the same personal computer. Data from building management systems captured in real time will be used to provide operators with information about:

- identification of performance deficiencies
- identification of opportunities for future improvement
- explanation of any underlying problems
- advice to the operator on possible remedial actions.

Reader enquiry no 1/6

Continuously variable capacity units

A range of standard continuously variable capacity (CVC) products

by **Margaux** constructed from standard modules with capacities of 6 kW to 470 kW over 22 models has been launched. Larger capacities can be achieved by using a larger number of modules.

The standard products are: supermarket refrigeration packs with one-six compressors; air or water cooled condensing units; compressor/receiver units; air or water cooled water chillers; industrial heat pumps; mechanical sub-cooling systems; and retrofit conversion kits for existing installations.

Energy savings of up to 55% have been demonstrated and temperatures can be controlled to within plus or minus 0.3°C .

The 'brain' of the system is the **MRC 1000** electronic controller which both achieves precise temperatures and protects refrigeration systems.

The range is seen by the manufacturer as being ideally suited to process cooling and environmental chamber applications operating on low temperature systems, mechanical sub-cooling and heat reclaim systems.

Reader enquiry no 1/7

Oxygen analysis

Teledyne's model 9600 oxygen analyser system provides continuous monitoring of flue gas — for improved combustion efficiency and reduced exhaust emissions. The model 9600 can be used with boilers, furnaces and process heaters that are fired with such 'clean' fuels as natural gas and low sulphur fuel oils.

The model 9600 uses a sample system centred around an air aspirator. The system automatically and continuously conditions flue-gas for accurate analysis.

Oxygen analysis is accomplished using a micro-fuel cell sensor. This electrochemical device features an absolute zero and an output that is linear with respect to oxygen concentration which means no zero gases are required for atmospheric air (20.9% O_2) is used for calibration. Three ranges of analysis: 0-5%, 0-10% and 0-25% O_2 are available.

Reader enquiry no 1/8

ENERGY WORLD — COMMERCIAL

(Photocopy acceptable)

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

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

Name

Address.....

Organisation