

ENERGY WORLD



The magazine of The Institute of Energy

Number 233
November 1995



INSIDE THIS ISSUE
District heating
and CHP



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to be presented by
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The Warden, Green College, Oxford

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I will/will not attend the Melchett Lecture on 16 January 1996
I will/will not attend the buffet reception held after the Lecture

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Presented to the National Council

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Presented to the National Council and the Institute of Economics

to be presented by

Mr. Michael Lewis
of the Institute of Economics

The National Council of the Institute of Economics

Friday 12th July 1957
at 10.00 a.m. in the

Lecture Theatre of the
Royal Institute of Economics
London W.C.2

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COVER

This month's cover is a shot of the 3.7 MW combined heat and power (CHP) plant at Albright & Wilson's Oldbury works.

Photograph by courtesy of National Power Cogen.



Who said coal was dead?

asks the Coalfield Communities Campaign

THE many pundits who confidently predicted — or even mourned — the complete demise of the coal industry during the past ten years reckoned without the tenacity and sheer grit of the people in it. A determination not to give in, to stand four square in the face of adversity, has characterised mining communities for centuries, and it speaks through every line of a new report from the Coalfield Community Campaign *Who said Coal was Dead?*

It concedes that the industry has had a terrible time over the last decade, with more than 100 pit closures devastating mining communities around the country. Yet more than 30 pits still survive — a significantly higher number than was anticipated in 1992 — providing about 20 000 jobs and producing more than 40 million tonnes of coal a year. Production costs are falling and the industry is beginning to win back markets lost to imports. If other industries had achieved such positive results they would have trumpeted their successes from the rooftops and been fêted by grateful government ministers.

But there are no accolades for coal. It is the industry most politicians would prefer to forget. And that's a pity, because like it or not there is still a lot of mileage left. UK coal still sustains the electricity industry by generating the cheapest power of any major fuel, and can compete on price with imports from any part of the world. It is still a leader in mining technology; it is the one indigenous source of energy that could sustain the British economy in a siege situation; and it has the capacity to make significant contributions to the UK trade balances if it is given a fair chance to compete on even terms.

In the European context it is the most successful coal industry west of the Urals. Its productivity of 1.422 tonnes per man-hour in 1994 was twice that of Germany, two and half times that of France, and almost four times the Spanish level. The consequent effects on costs were just as dramatic. German costs were the highest at 151 ECU per tonne, Spain notched up 131 ECU, France 110, while the UK scooped the pool at 62 ECU per tonne.

Not bad performances from an industry written off so frequently.

But its still not plain sailing. Although the industry has shown that it deserves a fair crack of the whip, many obstacles not of its own making still stand in the way. Although coal-

fired power stations produce cheaper electricity than gas or nuclear power, the market is artificially rigged against coal. Nuclear production is completely ring-fenced against price competition, and the new gas-fired stations, owned partly by the RECs themselves, are protected by long-term take-or-pay contracts which guarantee their slice of the market, regardless of price.

'It is in the interests of the national economy that the consumer should be able to reap the benefits of the cheap and reliable source of energy that the UK coal industry can still provide,' says the CCC report, and goes on to list five pre-requisites that could ensure fairer competition in energy markets.

- **No more 'sweetheart' contracts** under which RECs part-own gas-fired stations and automatically buy their power regardless of whether it is the cheapest fuel available;
- **restoration of competition** by returning to the merit-order system in which power stations with the lowest cost were called on first to supply electricity to the grid;
- **a ban on Orimulsion**, which is a danger to health from its high sulphur content and concentrations of poisonous and carcinogenic particles;
- **closure of Magnox nuclear stations**, which are all more than 30 years old. They are the least efficient nuclear plant, with irreducibly high operating costs, a fact tactically acknowledged by their withdrawal from the sale of the nuclear power industry to the private sector;
- **building of new clean-coal generating plant** to demonstrate the potential for this technology in the British context. Like any new technology they deserve Government financial support at the outset. Successful construction of two or three demonstration plants would give investors confidence to encourage more new stations.

If the UK does not bite this bullet, the alternative is that ever-tighter environmental controls could squeeze out coal as a large-scale power station fuel — a senseless waste of an abundant fuel that is available at a low price.

It is impossible to quarrel with the report's conclusion that coal has proved beyond all doubt that it can provide cheap and reliable energy. If the consumer is to benefit, and the coal industry to reap the rewards of its employees' hard work, there must be changes in the way the electricity industry is allowed to operate, the report concludes.

'Who said Coal was Dead?' is published by the Coalfield Communities Campaign, 9 Regent Street, Barnsley, South Yorkshire S70 2EG.



WEC Congress announces its conclusions and recommendations

THE 16th Congress of the WEC, held in Tokyo in October, has published its conclusions and makes a number of recommendations.

To start on the path to sustainability, the Congress recommends governments should take early action to phase out energy subsidies, so that energy services are priced on a full-cost basis. All those in the energy sector then need to take action to gain acceptance from consumers of full-cost pricing. They also advise that separate social welfare provision should be made where personal hardship and deprivation result.

Governments of both richer and poorer countries should come together, in a common cause with sustained effort, to ensure that commercial energy increasingly is made available to the 40% of the world's population who do not benefit from it

today, and therefore cannot satisfy their basic needs or hopes for economic development.

A major drive is required by governments and all those in the energy industries to improve education on, and understanding of, the wider implications of sustainable energy provision and use, and its significance for human welfare and the environment.

It also recommends the bringing forward of commercial provision of new renewable energy sources, encouraging energy efficiency, and calls on governments and the private sector to increase R&D expenditure and improve its effectiveness.

An even greater effort should be made by governments and the nuclear industry to secure public acceptance of nuclear power, both by technological development and the provision of accurate information.

Energy markets should be reinforced by governments and regulators to ensure that competition is effective, consumer expectations are satisfied, and that proper weight is given to the long term in order to support sustainable development. Governments should also ensure that world markets continue to be open for trade and investment under the auspices of the World Trade Organisation.

A new partnership between governments, the private sector and end consumers on a regional and global basis is called for to facilitate the path towards sustainable development, and so achieve an optimal balance between political, economic, energy and environmental considerations. Particular attention should be paid to developing new approaches for the mobilisation of finance for energy investment, especially for developing

countries. Governments, business decision makers and energy consumers are urged to start taking action now to adapt to the needs of our longer term future: not just in response to the risk of climate change.

The WEC and its membership have accepted the challenge to support education and the communication of accurate energy information, and to play their part in ensuring that commercial energy becomes available to all in the coming decades by promoting realistic appraisal of technological and financial needs, along with sound policy and decision taking.

● A feature length report on the 16th World Energy Council Congress by Professor Ian Fells of University of Newcastle upon Tyne will appear in the December issue of *Energy World*.

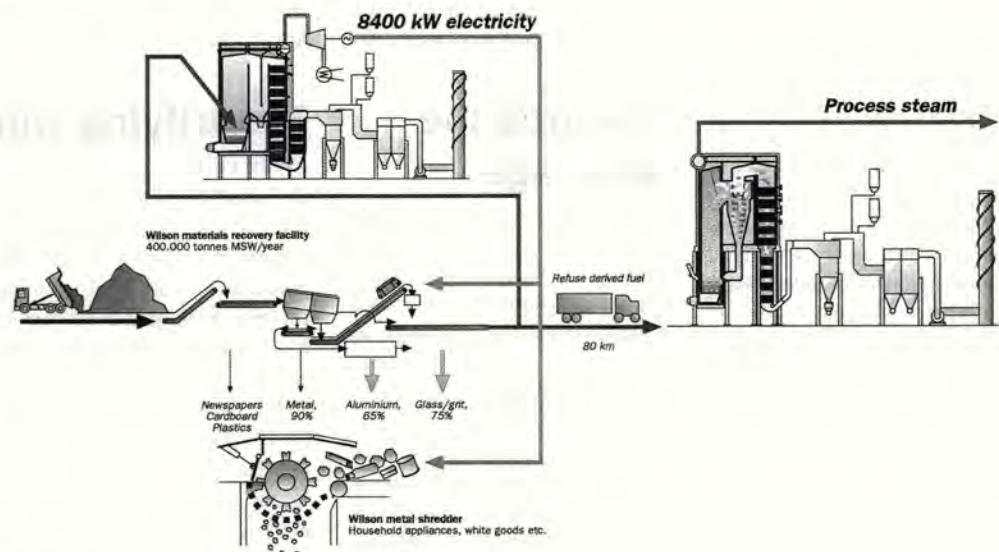
World's largest geoscience project

JAMES Cook University in Queensland, Australia is to take part in the Australian phase of the Ocean Drilling Programme (ODP) — the world's largest geoscience project.

Involving 19 countries and an annual budget of \$50 million, the three-year ODP has been described as the marine science equivalent of the space programme.

Sediment collected from rock cores from a vast area will provide important scientific information on the continental drift, the origin and nature of petroleum and mineral resources, global climate change and geological hazards.

34 Australian geoscientists from nine universities and the Australian Geological Survey Organisation have worked on ODP's drilling vessel JOIDES Resolution, a floating laboratory capable of drilling 2 km beneath the seabed in ocean depths of up to 7 km.



A PRIVATELY financed US consortium, Carolina Energy, has placed an order for two energy from waste plants, one in Kinston, the other in Wilson. The plants will serve several municipalities in the region and dispose of 400 000 tonnes of MSW annually. The waste will be burned in two fluidised bed boilers, one bubbling (BFB) and the other circulating (CFB) (schematic diagram above), provided by Swedish company Kvaerner EnviroPower. The company have demonstrated the feasibility of extracting energy and recovering raw materials from waste in a similar project for BCH Energy in Fayetteville, also in North Carolina.

The order for Carolina Energy involves a complete waste handling system. Recyclable materials such as steel, aluminium, glass, paper and cardboard are separated out and the remaining waste is burned. Directly adjacent to the sorting plant is one of the two combustion plants, a 30 MW BFB. Here, one third of the combustible waste (around 10 tonnes/hour) is burned to generate 8400 kW of electricity, used to supply power for the sorter and scrap metal crusher, and the surplus is sold to the national grid. 80 km away in Kinston, the 60 MW CFB will be built, and will burn the majority of the waste, around 20 tonnes per hour. The CFB boiler will produce process steam, which will be used by a nearby DuPont chemicals factory.

Emissions from the plant will be low, and comply with all existing environmental requirements.



Review of regulatory regimes

A COMMISSION of Inquiry into the regulation of privatised industries was established in October by the Hansard Society and the European Policy Forum.

Privatised utilities, investors, consumers and regulators are being invited to put their case to the inquiry, which will sit for the next twelve months.

The Commission is headed by the Warden of Wadham College, Oxford, John Fleming FBA, and includes as members National Power Chief Executive, John Baker, and Margaret Sharp, a senior research fellow at the Science Policy Research Unit at Sussex University.

The remit of the Commission is to review the present regulatory regimes for the private utilities, and to recommend changes in the light of experience and the evolving structures of the industries.

The focus of the Commission's work is on how regulatory decisions after privatisation are and should be made in the telecommunications, electricity, gas, water and railway sectors in the UK. It will consider the implications for decision making of the privatisation of public utility suppliers, the establishment of independent regulatory bodies (such as OFTEL, OFGAS, OFFER and OFWAT), the extension of competition in supply and the growing impact of European and UK competition and administrative law.

Three major aspects of regulation will be examined. First, it will look at the boundaries of the activities of the various regulatory bodies. Second, it will analyse how regulation is and should be carried out, this will include the nature of regulatory organisations, their powers, their processes of decision making, and their accountability to other bodies such as Parliament, Ministers and users. It will also cover the role of various interests in the regulatory decision making process.

New HSC gas safety campaign

A FATHER whose two sons died from carbon monoxide (CO) poisoning has welcomed a nationwide publicity campaign launched by the Health and Safety Commission and Executive.

The campaign aims to alert the public, particularly landlords and tenants, to the fatal danger of CO poisoning from poorly installed or badly maintained gas appliances.

Official figures put deaths from CO poisoning at around 30-40 a year, a figure which fell to 29 last year. Unofficially, it is likely that the figures are much higher, as CO poisoning as a cause of death is often not spotted by doctors.

Environment Minister Sir Paul Beresford attended the launch, and welcomed the backing being given to the campaign by British Gas TransCo, CORGI and the Gas Consumers Council. He said: "Last year we recognised the need for new safeguards to address the dangers of gas-related CO poisoning and accepted, in full, and put in place at the

earliest opportunity, the HSC's proposals for the Gas Safety (Installation and Use) Regulations 1994. These require landlords to maintain in a safe condition gas appliances they own and which are installed in property they let, to arrange annual safety checks to be undertaken by CORGI-registered installers, and to provide proof that the checks have been completed if tenants ask for it."

Mrs Ann Scully, an HSC Commissioner whose particular role it is to champion the interests of the public, said: "Landlords and managing agents must keep a record showing that a safety check has been completed and make this available to tenants if they ask for it. A landlord or managing agent who has not complied with these obligations is in breach of the law."

HSC outlined proposals to strengthen the 1994 Regulations even further, including the requirement to examine flues. If Parliament approves, the amendments will come into force on 1 April 1996.

Towards the solar age

FUNDED by various charitable trusts, and now the National Lottery, a small local London charity is constructing the sixth building in the UK to produce its power from roof-mounted photovoltaic (pv) panels, and sell its electricity to the national grid.

The four-week project in October sought to build from scratch a new recreation building at Homerton Grove Adventure Playground. The site, supported by Greenpeace with the loan of their portable solar generator, Cyrus, is probably the first in the country to operate on solar power.

The building acts as a solar heat collector, and is highly insulated using recycled newspaper and triple glazed windows. Among the companies supporting the scheme are London Electricity, Naylor Clayware and Excel Industries.

Electrifying win

AN ELECTRIC car under test at De Montfort University proved one of the most efficient in Europe at a recent UK trial. The Solectria EV car beat 23 entrants to take first prize in the 12 Electric Hours of Oxford electric car run.

The two-day event, organised by Oxford City Council and Citelec, the association of European cities interested in electric vehicle use, and sponsored by Southern Electric, demonstrated the capacity of electric vehicles to help justify their integration into urban traffic environments.

Driven by DMU research student Iain Fraser of the University's AMSET Centre, the virtually silent Solectria gained the accolade for the most energy efficient vehicle (0.103 kWh/tonne.km) by covering 69 km with less than half its battery capacity.

Electrification for Muck

A BID is to be made for European Objective 1 funds to rescue and complete the long-awaited Muck electrification scheme.

This was the outcome of talks held in Fort William involving partners in the project, including the Highland Regional Council, Lochaber Ltd, the Isle of Muck Community Enterprise Company Ltd and British Telecom.

The scheme was promoted at the same time as the construction of the £250 000 Muck Primary School, but progress has been delayed by the liquidation of the main works contractor, Windharvester Ltd, in summer 1994. Since then, the partners have actively researched the technical and financial options for completion of this important project for the Isle of Muck. The meeting considered a feasibility study report which demonstrated a viable way forward, subject to funding availability. Urgent efforts will now be made to assemble a funding package, including a bid to the European Objective 1 fund towards the estimated cost of £200 000.

Gas pipeline for N Ireland

A NATURAL gas pipeline is to be constructed from the Ballylumford power station on Islandmagee to Torrytown, south of Carrickfergus.

The pipeline is the first major engineering contract in a £150 million project to develop a natural gas industry in Northern Ireland. The gas will be delivered to industry, commerce and households in the Greater Belfast area.

Premier Energy Suppliers, a subsidiary of British Gas, has awarded the contract to lay the gas transmission pipeline to the Alfred McAlpine Brown and Root joint venture. Total British Gas investment in Northern Ireland will be around £450 million, with the project being partly supported by the EU.



'Safe change' filtration for BNFL complex

A MODULAR 'safe change' air filter containment system has been developed jointly by Vokes and British Nuclear Fuels for use in critical air handling applications. The system has been installed recently at BNFL's new oxide fuels manufacturing complex at Springfields, near Preston, the most advanced plant of its kind in the world.

Designed to handle air volumes up to 324000m³/h, the containment system uses Vokes circular plug-in absolute filter cartridges with an efficiency of 99.99%. The compact circular design of the system permits higher air flows with lower pressure drops and saves space, when compared with traditional square section filtration units.

The system is used on air extracts in numerous locations throughout the new plant, which converts enriched UF₆ (uranium hexafluoride) powder into UO₂ (uranium dioxide) fuel pellets for AGR and PWR nuclear power stations worldwide. The system maintains optimum air quality throughout the plant by eliminating the potential risk of particulate contamination. It also ensures that operators can replace filter cartridges in total safety.

A large proportion of the containment modules are installed as multi-module filtration containment systems in the main filter

plant rooms. These are used as second stage filters on both the primary and secondary air extract systems serving primary and secondary sealed processing and storage areas. Arranged in compact banks of multiple units, the safe-change modules feature sliding carriers to facilitate the loading and unloading of cartridges. A ring around the filter access allows the fitting of a safe-change disposal bag.

Individual modules are also located around the plant to provide localised air extract filtration on specific items of process plant. These include installation on feed and check/weighing hoppers in the main processing line, as well as on pre and terminal filtration on primary and secondary air extract systems. They are also used in various secondary containment areas for first stage terminal filtration.

Additionally, special pre-filter modules are used in conjunction with a Vokes first-stage HEPA filter on the primary extract system. These units are located adjacent to primary containments to provide local first stage filtration. Local indication of differential pressure across each filter is provided.

The new BNFL oxide fuel complex at Springfields represents the largest investment to date by the company's fuel division. It embodies the most modern



Vokes safe-change filtration system installed at BNFL's new oxide fuels plant. Pictured above is one of the multi-module filtration containment systems installed at Springfields.

and highest standards of technology available and integrates all the processes for the production of finished oxide fuel assemblies and intermediate products in a single plant. It was designed and built to the highest standards of safety, to ensure a clean working environment and meet the most stringent of regu-

latory and licensing requirements.

The circular safe-change containment system is based on two standard module sizes, and can be used in banks of up to 12 modules, manufactured from either mild steel (with an epoxy paint finish) or stainless steel.

New thermal imager is simple to use

THE NEW Land Cyclops TI 35+ thermal imager offers many features which make it even easier to use for preventive maintenance and condition monitoring.

These include a digital interface which allows exchange of data directly to an IBM-PC or notebook for subsequent study and processing, and a colour output for displaying thermal images on a standard colour monitor.

Other new features are:

- a high quality colour LCD

viewfinder for improved image contrast and viewing;

- built-in memory for instant capture of images and recall through the viewfinder. Images stored on the PC can also be replayed through the imager;
- post-processing in the imager

— allowing users to check and adjust calculations, re-set variables, measure temperature at any point in the image, and add extra displays such as temperature profile and isotherms.

All of these facilities are avail-

able as modular additions to the standard TI 35+, allowing the user to match its capabilities to his specific requirements. In its fullest form the TI 35+ provides an unsurpassed range of facilities for the plant maintenance engineer.

The temperature sensitivity of thermal imaging has also been improved, reducing noise levels and making it capable of discriminating between smaller temperature differences.

The optional software package

LIPS for Windows™, Land's PC-based image processing system, allows thermal images captured by the TI 35+ to be stored and manipulated, and also allows full remote control of the imager functions via the PC.

In addition to the extensive range of temperature processing capabilities LIPS for Windows™ now has its own integral report writing facility, so that data from the imager can be included in reports without recourse to a separate word processing of condition monitoring program.



THE UK produces some 30 million tonnes of municipal waste per annum, part household, and part commercial waste. Many conferences have been organised by various bodies, including the Institute of Energy, the Institution of Mechanical Engineers and the Department of the Environment, to consider the ever-growing problems regarding the disposal of this putrescible material. The problems include pollution, particularly from methane emissions and leachate from landfill sites; the increasing scarcity of suitable landfill sites, and the transport by bulk disposal vehicles to these sites which may be located at a considerable distance from the source of the waste.

In 1993 the Royal Commission on Environmental Pollution, 17th Report, Incineration of Waste, recommended that the Department of the Environment should give high priority to completing a national strategy for waste management based on a four-stage decision procedure, as follows:

- wherever possible avoid creating wastes;
- where wastes are unavoidable, recycle them if possible;
- where wastes cannot be recycled in the form of materials, recover energy from them;
- where the foregoing options have been exhausted, utilise the best practicable environmental option to dispose of waste.

The report also concluded that whole hearted adoption of this approach, through control of waste creation at the point of pro-

SELCHP — a success story

by Byrom Lees* and David Purdy**

It is now nearly two years since the combined heat and power facility, fired by municipal waste, was commissioned, and a year since its official opening. This article looks at the operating experience so far, and the possible implications for the future of waste disposal in this country.

duction and vigorous promotion of recycling of unavoidable wastes, would eliminate some wastes but there will still remain, for the foreseeable future, substantial quantities of waste for disposal.

In 1986, faced with the increasing scarcity and environmental problems of landfill, the London Boroughs of Lewisham, Southwark and Greenwich came together to search for and identify a realistic alternative.

In 1988 they formed an organisation — The South East London Combined Heat and Power Consortium — SELCHP.

Throughout Europe, Japan and the USA, the problem of the disposal of municipal waste has become acute and incineration plant has been developed to utilise the energy for power generation or combined heat and power schemes.

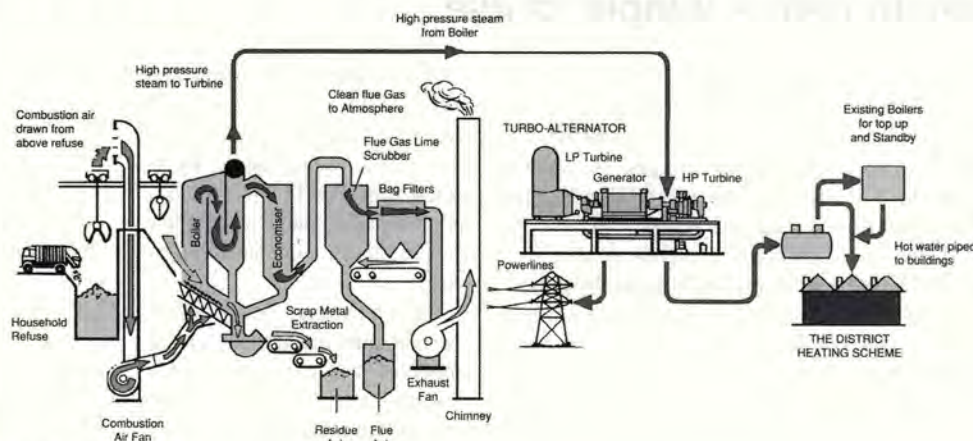
It has been reported that in Switzerland 80% of municipal waste which cannot be recycled is incinerated. In the USA developments have been comparable with those in

Europe and the quantity incinerated in the last 10 years has increased from 13% to 19%. In contrast, the UK sends more than 90% of its waste to landfill.

The efficiency of utilising the heat produced by incineration may be tripled if a heat and power scheme is adopted, as in many European countries, rather than producing electric power alone. This is only practical when the incineration plant is located close to town or industrial sites.

The SELCHP consortium has always emphasised from its conception the importance of working in cooperation with the local community, from the planning stage to full operation, and has linked the plant designers, operational specialists and pollution authorities. The SELCHP plant incorporates the latest European developments and has been designed to accommodate current and anticipated EC requirements.

The plant was commissioned in December 1993, and was officially opened by the



Schematic diagram of the SELCHP plant.



The SELCHP plant at Deptford in London. Millwall football ground is situated top right of the picture, with the access route for the lorries carrying municipal waste on the bottom left.

Prince of Wales on 29 November 1994. It has operated satisfactorily to date.

The SELCHP facility consumes some 420 000 tonnes of municipal waste per annum. The waste is delivered to site by road and tipped into a holding pit, it is then transferred by crane to the incinerator feed chutes. There are two Martin incinerators, each consumes 29 tonnes of municipal waste per hour. The two boilers deliver a combined steam flow of 156 tonnes, at 45 bar and 395°C, to a steam turbine producing 35 MW.

The exhaust steam passes to a group of fan-assisted air condensers. To alleviate the potential problem of refuse odour, all combustion air is drawn from the tipping hall. Combustion is strictly controlled to ensure that the conditions for the destruction of dioxins, a temperature >850°C for a minimum of two seconds with an excess oxygen of at least 6%, are observed. The flue gases pass to a semi-dry lime scrubber unit to remove acid gases. Activated charcoal, to

remove final traces of dioxin, is also injected at this point. The flue gases pass through fabric filters before venting to atmosphere at a temperature of 150°C from a 100 metre chimney. The chimney windshield contains two insulated flues to ensure minimum corrosion and to prevent build up of smuts. The gas exit velocity is in excess of 15 metres per second, and under normal weather conditions there is no visible plume.

The furnace bottom ash is processed to recover the ferrous component, which is then recycled. The remaining inert furnace bottom ash goes to landfill. A possible use for this ash could be as light aggregate. Trials have shown that a modification to the bottom ash treatment could lead to the recovery of the copper-based alloys and aluminium content. Initial results show a potential to recover up to 2%, combined metals, from this ash.

The atmospheric pollution control dust, from the scrubbers and fabric filters, is classified as special waste, as it contains in

excess of 10% free lime. The atmospheric pollution control dust goes to a licensed disposal site.

The emission concentrations in the flue gases are measured regularly to ensure that they meet HMIP limits. Table 1 shows HMIP limits and typical concentrations at SELCHP.

The proposed district heating scheme will serve some 7500 homes. There will be an eightkilometre double circuit of buried insulated pipe. The system will operate under pressure with a hot water temperature of 100°C and a return water temperature of approximately 70°C. This final stage of the design concept will more than triple heat recovery from waste.

The gate fee at SELCHP is high compared with some of the older landfill sites with

**Fuel Technology Consultant
**Consultant Chemist,
SELCHP*



long-term agreements. When SELCHP was brought on line the two main sources of municipal waste were Lewisham and Greenwich. Other boroughs, notably Westminster, are now realising the value of disposing of some of their waste without pollution problems caused by methane emissions, particularly associated with global warming, and by water pollution from leachate. Also, in the south east, landfill sites are less readily available.

SELCHP is the first municipal waste incinerator built in the UK to meet the requirements of the EC, the Department of the Environment and local residents. The designers and contractors are to be congratulated on completing the plant ahead of schedule. The plant is fitted with the latest generation of control equipment and the results of measurements indicate that it fully meets the environmental standards.

It is considered, based on the very satisfac-

Table 1: Typical emission concentrations

	HMIP limit mg/m ³	measured mg/m ³
Nitrogen oxides	450	400
Carbon monoxide	80	16
Hydrogen chloride	30	5
Hydrogen fluoride	2	0.08
Sulphur dioxide	80	20
total particulate matter	20	0.7
volatile organic matter	20	<3
cadmium	0.1	<0.01
mercury	0.1	<0.02
other metals total ¹	2	<0.02
<hr/>		
dioxin (ng/m ³ (TEQ))	1	<0.05

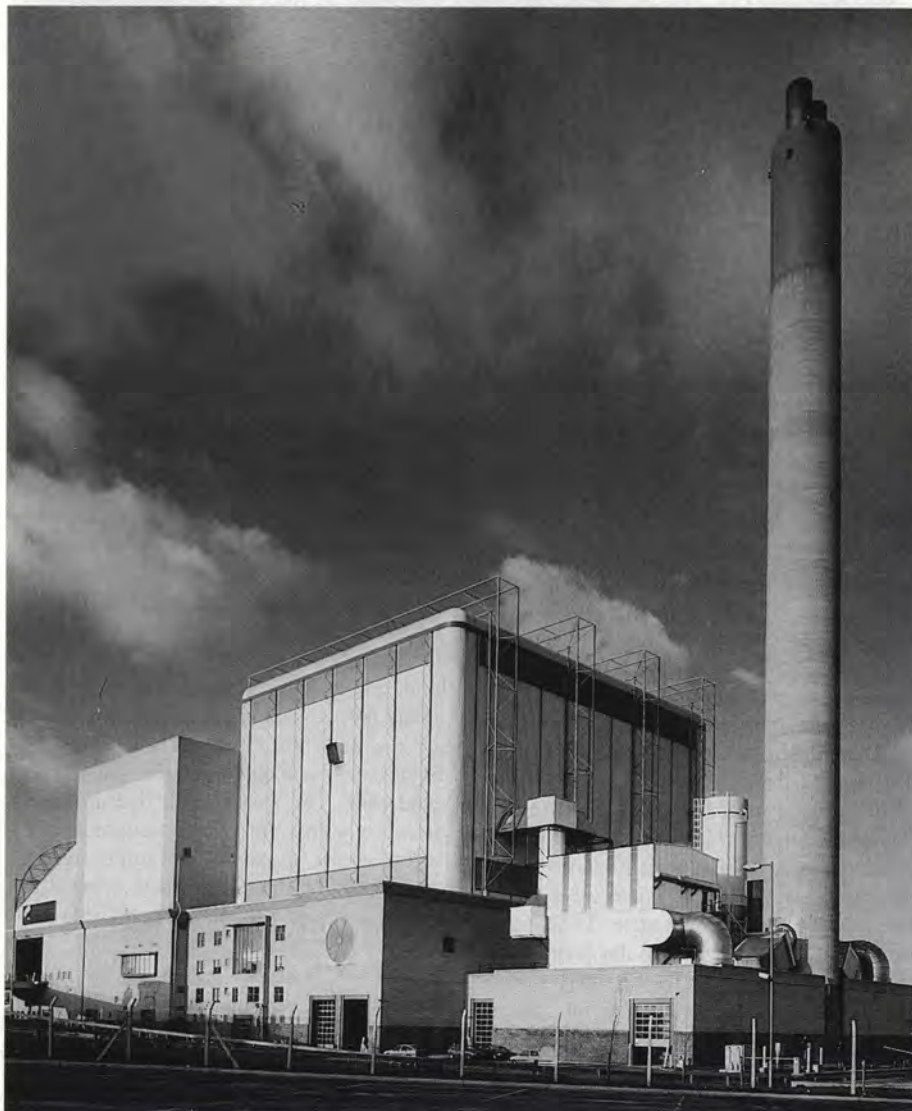
¹Other metals are arsenic, chromium, copper, lead, manganese, nickel and tin.

tory results achieved at SELCHP, that there is no reason why the UK as a whole should not efficiently utilise the potential heat in that part of municipal waste which cannot be

recycled, as is practiced in other developed countries.

The disposal of municipal waste containing putrescible material on landfill sites is to be depreciated. The introduction of municipal incinerators, as at SELCHP, eliminates this problem.

It has been indicated that London requires five more similar-sized units, and that 50-70 incinerators in the range 200 000-600 000 tonnes per annum would be required to achieve 50% incineration of the UK output of 30 million tonnes per annum of municipal waste. □



The efficiency of utilising heat produced by incineration may be tripled if a heat and power scheme is adopted. It is intended that SELCHP will eventually provide district heating.

The authors

Byrom Lees began his career at the Fuel research station in Greenwich, London in 1937, and took an external MSc at London University. He has worked for the CEGB and BP, and has been a member of the Institute of Energy since 1949. He became a senior fellow in 1965, and in 1975 received the Institute's Lubbock Sambrook Award.

David Purdy is a fellow of the Institute and a member of the Royal Society of Chemistry. He served more than 40 years as a chemist with the CEGB and National Power. He retired, aged 58, in 1993, and for the last two years he has been acting as a consultant at the SELCHP site. For some years he was active on various committees of the British Standards Institute and the Institute of Petroleum, and currently represents the BSI at international level.



Community heating — and cooling

by Norman Jenkins

WHAT is *district heating* to some, and *district cooling* to a smaller number, is also *co-generation* — to those who accept *district heating* as the universal term, expressed in English, throughout Europe. We in the UK, hoping to be measured against this scale also use the same term for our block, estate and institutional heating. Altogether a mixed bag, and indeed very misleading. Another term, believed to be coined by the US Ford Foundation, to indicate self-generation and heat supply for schools, was *total energy*. Not a bad description, and certainly an improvement on the descriptions that have followed its lamented demise.

The reason 'total energy' was lost is believed in some circles to be due to the opposition to this technology being adopted for public service by the electricity and gas industries. Where heat is distributed in large areas of cities and towns as part of a public utility, these two other suppliers, of what they choose to call *energy*, lose all their business in the field of space and water heating. It is perfectly understandable they should oppose it — but surely not to denigrate and obstruct, protest that district heating is uneconomic, a technical failure, an obstruction to traffic and prejudicial to electricity generation. The latter is indeed an own goal.

Proven route

While certainly reducing the amount of electricity a conventional steam turbine can produce, the back-pressure option for maximising energy output, in place of condensing maximising electricity production, the root of the argument, is not only far cheaper in both capital and running costs, but is also the better option in that lower temperature operation leads to longer turbine life — up to 70 years or more in practice. No more R&D

It is time for a new look at, and a better understanding, of this most crucially important technology, and its contribution to global ecology. There is no need to push back the frontiers of science: repressed in some areas, but developed over a century, only serious re-thinking and strong resolution are needed.

is needed, this is the long-proven route.

Back-pressure is far cheaper. The two reasons for this include elimination of non-essential low temperature/pressure stages, which in condensing units cost as much as the remainder merely to extend efficiency from 30% to 40% at best. The other, equally cogent reason, is that in total energy supply it is far cheaper to meet space and water heating needs by distributed hot water (or steam) than by electricity. (Or for that matter, by gas). The lesser amount of flue-gas emissions that have to be accepted, or cleaned, is significant and measurable, to such an extent that if all condensing generation were to be replaced by back-pressure — and adoption of the now perfectly feasible flue-gas condensing by refrigeration, or other emissions eliminating processes, there would be no emissions problems at all. This cannot be stressed too strongly, nor the part played by the established energy industries in obstructing this technology.

Sweeping statements of this character need proof. And, of course, proof backed by practical achievement, and, preferably, long-established proof: steady expansion and consumer acceptance, financial viability and shareholder satisfaction.

Any and all such proof exists and has done before and since the International Union of Heat Distributors (UNICHAL) was formed in Paris by nine subscribing countries in 1954. Exhaustive statistics have been collected, collated and published — but have only been publicly available since 1985. The UK contribution is meagre and virtually useless. Up dated every year, this now substantial amount of authentic data is published for UNICHAL members, and available on appli-

cation to UNICHAL headquarters in Zürich.

This achievement, first from some 16 out of 20 members' data, and since accession of new members, from former COMECON countries in the last three to four years, amounting to 400 GW of installed plant, and 80 000 km of distribution mains, and now, in 1995, a total of 175 000 GW and 365 000 km. Not to be sneezed at, denigrated, depreciated or discounted. Not all of the utilities concerned are independent heat distributors; many of them are subsidiaries of electricity generators, national or regional, where finances are interlocking and convoluted.

Comprehensive

The best financial pictures are to be seen where the integration of public utility services has combined energy supply with cold water, sewage, municipal solid waste (MSW) incineration, as well as trams, buses, street and traffic lighting. Brescia in Italy is the outstanding and most comprehensive example, but not necessarily the only one. Stockholm, venue for the 27th UNICHAL biannual conference last June, has a fascinating mix of utilities and ultra-modern technology concentrated into Stockholm Energi. This company's use of heat pumps, doing dual duty for city cooling as well as heating, uses sea or lake water as source in appropriate seasons. Stockholm management has found operation of heat pumps entirely economic and financially most rewarding. At times, Stockholm can be supplied from this plant entirely without operation of its fossil-fuelled or incineration equipment — entirely without emissions of any kind, driving the heat pumps by its own hydro electricity.

In these respects Stockholm may be a special case. Nevertheless, this city's long experience in heat distribution has benefited Sweden as a whole, and now provides advice for Eastern Europe's activities in this field, where conversion to a concept of market economy has demanded adoption of more cost consciousness and better engineering with more specific administration than was possible under a less democratic regime. The UK has no such experience to offer; we are losing significant amounts of engineering and consultancy business.



Both Berlin and Stockholm have learned to exploit machine capabilities to the full. Both have turbines of 60 to 70 years of age, whereas when Battersea power station ran out of steam, the two house turbines of some 3 MW, supplying heat and power, were junked, after a mere 30 years. Westminster made the error of building a hot water boiler to supply the limited Pimlico district heating scheme, instead of supplying steam to existing turbines. Another gross error for which someone should be held accountable.

To be put into the same category of culpability is the destruction of some hundreds of turbines, formerly set up and run when electricity generation was originally and largely produced by local authorities, pre-nationalisation. Most of them and their supporting ancillaries could have been converted to supply heat and power, and formed the nucleus of what Brescia and others have done so successfully in the last 20 years.

Our attempts to follow these last examples have been frustrated, hampered and hindered, handicapped by lack of knowledge and assistance from those who have succeeded — and learned by experience. To be capable of achieving both the maximum energy efficiency and the minimum emissions, of which these schemes are capable, it is essential for any such comprehensive concept to be based on an experienced understanding of the heat to power ratio of average load demand of the urban area concerned; and the capabilities of basic energy-producing plant. Both the UNICHAL statistics and evidence adduced by a dedicated research project carried out by the Amsterdam Free University for the ECE some five to six years ago show that energy is not an international, nor a national but an urban concern — and the average heat to power ratio is most likely to be 2:1.

Cheap and convenient

Since this 2:1 ratio coincides with the output of both back-pressure steam turbines and aero-derived gas turbines (without combined-cycle working), the whole concept of local energy supply is drastically simplified. With this working ratio as the basis, marketing of energy can proceed, heat and power hand-in-hand, selling heat and power to willing customers. That is, once they understand how much cheaper, how much safer and much more convenient distributed heat is than any former method.

But up to now we have only tackled our problem — the overall energy/environment problem — piecemeal, trying to satisfy waste disposal or heating needs without consideration of the economics and overall efficiency of the joint need. Whether households, commercial, institutional or industrial, the need is simply for heat and power. All power pro-

duced necessitates heat — that must not be wasted. But rubbish incineration without generation but with heat distribution (Sheffield), as with generation without heat distribution (as yet, SELCHP) are our latest examples of truncated development, handicapping the local authorities concerned, spending money without closing the circle, without the foresight to cater for 20 to 50 years ahead. The list does not stop at two. Many other examples come to mind, including the attempt in the 1950s to supply London's Barbican from the now closely adjacent but defunct Bankside power station: 100 MW of electricity only, and not a drop of distributed hot water in sight. Bankside could, as well as Battersea, have supplied heat and power to all London.

Fortunately, there is a light at the end even of this long tunnel. Unfortunately, although this is a solid, accessible and acceptable proof, there is no instant recognition of standing and responsibility. While UNICHAL has just now gone through a cathartic process of reorganisation and restatement of aims, it is internal only. There appears to be no plan for publicising, for example, the 1750 GW and 365 000 km of distribution mains, and no apparent intention to claim more attention for heat distribution than either gas or electricity, despite complete justification. The moves made include a change of name: no longer the International Union of Heat Distributors, but EUROHEAT & POWER Unichal, with the intention to drop UNICHAL as quickly as possible — in my opinion, just about the most ill-conceived decision a 40-year-old, highly successful, international organisation of any kind could possibly make. A completely new subsidiary office has been opened in Brussels, ostensibly to provide a meeting place for committees and advice, and to afford access to the European Union headquarters, and its energy/environment officers and departments. The headquarters remains in Zürich, but it now independent of the Swiss Electricity Union, that formerly provided staff and facilities. A new general secretary has been appointed, a widely experienced engineer.

The new UNICHAL (few who have been acquainted for a period of years are likely to abandon the old cognomen) has produced a set of brochures describing the organisation and its aims, forgetting apparently that plant and network achievement in the process. While everyone on the sidelines can do no more than wish EUROHEAT & POWER Unichal every good fortune, and instant acceptance of its ambitions the better informed and knowledgeable onlookers can only guess at the handicaps these well-intentioned decisions have instituted not only for UNICHAL as we know it, but for those of us who depend on their experience for solving national and even global problems of

staggering magnitude.

The June meeting of UNICHAL will go down in history for its emphasis on district cooling — and the somewhat sketchy, amateurish, technical paper on the subject. If this had included even a tentative approach to the now well-known 'pinch' effect of system planning, it would have shown the tremendous potential for heat extraction when allied to heat distribution. To separate the two, as appears to be the now accepted method, is only to hinder a new approach to even more economic direction and certainty for this technology — a public service potential — of heat distribution.

Heat pumps

The use of heat pumps in Sweden was mentioned earlier, but not for flue-gas condensation, a development of emissions elimination. While Uppsala, the University City, is experimenting with this — the ultimate in clean-fuel use, we have no information on economics, although confusingly there appears to be a claim for more than 100% thermal efficiency. Unless this includes some form of ambient temperature compression, an alternative explanation would be helpful. As they say: Watch This Space.

The light at the end of the tunnel does not only come from the new UNICHAL, but from the Netherlands, in stronger measure. In view of the survey so far appearing here it would seem almost incredible how far the Dutch have gone. A new organisation, ENERGIENED, has been set up to replace the former three organisations responsible for district heating, electricity and gas (both production and distribution).

By mandate no heat may now be sent to waste in the Netherlands. All existing and potential waste heat must be collected and distributed. It is as simple and as far-reaching as this. Distributed heat is now the basic, accepted principle. It is not too difficult to understand, if indeed it is so far removed from our own national energy and environment policies, that we find it almost unreal. Distributed heat has been the only answer to the energy efficiency and environmental pollution problem for years past. The obstacles to clear thinking and planning, taking this as a guiding principle, have been so great as to be wholly intimidating, an impossibility not worth wasting time even to contemplate.

Well, the Dutch decision has been made, the single-purpose organisation is now in being, and it only remains for us to watch developments: to see how it works out in practice, and how long it takes for a reasonable impact to be made on any aspect of what, and will remain, a global problem. The Dutch are to be congratulated on having the considerable courage of their convictions, and the ability of what must have been, at



least at the outset, a minority pressure group, mustering facts and presenting convincing and irrefutable arguments.

This survey would not be complete without the reference to the last several years' attempts by ETSU to clarify waste-to-energy activity and its associated environmental clean-up. Unfortunately, it has to be said, the current situation is one of almost complete chaos — if maximising energy output and efficiency is and was the determining aim.

Considering and contrasting the Nottingham, Coventry, Sheffield,

Birmingham and SELCHP activities — not excluding the Hampshire attempt at Portsmouth, there is no common plan for the use of waste incineration, no agreement on the use of the heat resulting for producing electricity *and* heat for distribution. There seems to have been little regard for the continental example and experience, until Birmingham's and Hampshire's intentions to form service companies with French assistance.

But even now, with surely full understanding of what is meant by temperature gradient

— and exergy — SELCHP can be frustrated in attempting to distribute heat despite its back-pressure turbine; Sheffield can be frustrated from generating while wholly successful in heat supply to a city where congested streets have formed no handicap.

And so it continues. Until we adopt the wholly sensible Dutch policy, giving priority to heat distribution and, virtually zero waste, we are going to find the European Union adopting this entirely acceptable method, leaving us the truly dirty man of Europe. □

REPORT No 30 from the Watt Committee on Energy is probably one of the most moving and lucid arguments promoting the use of district heating — local authority combined heat and power schemes — as a way of coping with fuel poverty in the UK.

So wide has the divide become between the 'haves' and the 'have nots', that it seemed to come as quite a shock to many when the Watt Committee reported that the poorest households in the UK spend as much as 20% to 30% of their income on less-than-adequate heating. Out of a total of 23 million households, eight million were found to have inadequate heating. This breaks down to around two-thirds rented accommodation, one-third poor owner-occupier (mainly elderly people): housing stock that tends to have inadequate insulation, resulting in high heating costs, temperatures below the 16°C discomfort level, and health problems associated with condensation and fungal growth. The report estimated that the cost to the National Health Service is around £1000 million a year in extra health care required to cope with the attendant health problems.

The report decided that 'affordable' warmth should be defined as no more than 10% of the household income to be spent on heating. Of course, the poorer a family is, the less likely they are to be able to afford that 10%, and perhaps a sliding percentage scale would have been a fairer option. But the report clearly demonstrated why VAT on fuel cannot easily be compensated for by uniform uprating of benefits and pensions, particularly when geographical variations are taken into account. It was also very possibly influential in the final acceptance by

Watt can be done?

by Johanna Fender

The Watt Committee on Energy published their study, No 30, *Domestic energy and affordable warmth in 1994* (reviewed in *Energy World, Book Reviews, January/February 1995, number 225*). The report has since excited a great deal of interest, and was the subject of a National Right to Fuel Campaign conference in April 1995.

Parliament of the recently-passed Home Energy Conservation Act, requiring local authorities to upgrade the energy efficiency of their housing stock, and setting demanding targets for reduction in energy use.

The National Right to Fuel Campaign organised a conference in April of this year *Energy efficiency and affordable warmth*, partly inspired by Watt Report No 30.

Chaired by Baroness Jenny Hilton, the meeting was held in committee rooms four, in the House of Lords, and included a presentation by Professor Thomas Markus of Strathclyde University, who was chairman of the Watt Committee's working group on the report.

The first session began with an impassioned presentation by Cathy McCormack. Ms McCormack, unlike the other speakers that day, is not an energy professional, and yet her down-to-earth, honest evaluation of the situation from the point of view of her own experience, resulted in the most impressive presentation of the afternoon. A single mother of three from Glasgow, she has lived all her life in damp housing. A decade ago, out of a sense of desperation and determination that her children, and millions of others like them in the UK, had the right to warm, dry housing, she began her campaign with

the Easthall Residents Association (ERA). In the ten years since then, the community she campaigns for has seen encouraging changes, and 1992 saw the completion of the first-ever tenant-led passive solar energy demonstration project. Perhaps one of their greatest achievements has been to inform both the general public and the Government. The desperate nature of the situation is summed up beautifully in an article Ms McCormack wrote in 1993 for *Community Development Journal*:

'The reason why our homes were so cold was that the people who designed them never took our severe winter climate into consideration. Because they were never insulated, they could never keep the heat in or the cold out, and our bedrooms were sometimes colder than outside. They were neither wind nor water tight. Because the internal fabric and walls of the flats always remained cold, it meant that when any warm moist air was produced when people breathed or boiled a kettle, the steam condensed on the cold surfaces which was ideal breeding conditions for fungus.

'I was continually having to throw out mouldy furniture, clothes and toys, and found myself having to choose between feeding my hungry children or hungry fuel



meters which kept demanding more and more money.' Research carried out by the Association produced a conservative estimate that as many as 10 million people throughout the UK share this struggle against damp housing. A shameful record for a country that likes to call itself 'developed'.

In 1987 ERA helped to organise a three-day competition of ideas called Heatfest, which attracted people from all over the country: architects, quantity surveyors, engineers, housing managers, university lecturers, energy conservationists, and representatives from other tenants groups. It was the first time residents who had to live in such appalling conditions got the chance to come face to face round a discussion table with the professionals who in the past were responsible for creating those conditions.

Cathy McCormack gave a highly informative perspective to the proceedings, which demonstrated the value of empowering residents to take action to remedy the terrible conditions in which they are forced to live.

Crispin Webber, operations manager with the London Borough of Waltham Forest, talked about his employer's integrated energy strategy, enabling a variety of departments to work together, and therefore attract greater revenue. They are giving emphasis to creating energy advice centres. In addition, any of their housing stock to be refurbished now has to have an energy dimension included in the plans. All larger capital programmes now require an environmental impact assessment. Waltham Forest is also looking at a 'heat with rent' package, whereby residents pay more rent for energy enhancements in their homes — eg, a £20 insulating hot water tank jacket paid off at an extra 50p per week. The borough council believes it is important for local government to link up with the private sector by, for example, offering energy labelling to all houses. Mr Webber acknowledged that the fuel poor see little benefit from this type of alliance, but suggested the initiatives could free up council funds for use in the public sector.

Another participant in the Watt Committee report, Bill Sheldrick, spoke in his capacity

as head of R&D for Heatwise Glasgow. His opening words delivered a forceful message: 'We hear about the destruction of the rainforests. We hear very little about people in Britain forced to burn floor boards and doors to stay warm.'

He quoted from a case study of the Easterhouse estate in Glasgow, which backed up Cathy McCormack's account of the misery suffered by the fuel poor, and looked at actual and possible solutions. Of short-term measures, £9-£10 million is spent treating the symptoms of fuel poverty, with often toxic chemicals, and granting compensation. Of Easterhouse's £4 million 1994 housing budget 52% was spent on dealing with condensation in inhabited homes or renovating void houses, empty because of the effects of condensation. Long-term savings can be achieved by installing energy efficiency measures, which can reduce a household's heating bill from £20 to £2 or less per week. To the question posed: Watt can be done? Mr Sheldrick replied that a great deal can be done, providing the political will is there.

These three speakers comprised the first session, which was followed by a discussion of the issues raised.

Thomas Markus started the second session. The chairman of the Watt Committee's working group for report no 30 identified areas relevant to state intervention: an integrated policy; a national fuel poverty audit; local authority energy plans and audits (provided for in the Home Energy Conservation Act 1995); specific legislation, ie, 160 Acts of Parliament use the terms 'house', 'housing' and 'dwelling' without defining that term. There is no reference to the fact that the main purpose of a house is to make it independent of the outside climate, and consequently there is no recognition of the fact that it is failing as a shelter if this is not achieved; and energy rating (also provided for in part by the Home Energy Conservation Act).

Professor Markus made a very important point about leaving such policy to market forces. If you assess the incomes of local authority tenants, then rank them from poorest to wealthiest, and those living in the worst

to best housing, you find that the poorest tenants live in the worst, most difficult to heat housing. If this occurs in an environment where the market does not operate, how on earth can you imagine that it will be rectified in a market situation?

The next speaker, Nigel Evans, put the case for market forces. He argued that changes in the energy market could mean that the fuel poor are seen as a profitable sector — a concept that many present found distasteful, particularly after Cathy McCormack's very human account. Competition, he argued, should bring down the price of fuel, although this has not happened so far in the domestic sector. But with several changes that are in the offing, such as opening up the domestic energy market to competition in 1998, and continued restructuring of the energy sector, this could happen in the near future. Unfortunately, privatisation of the electricity supply industry has so far led to an increase in bills for the very poorest customers, with higher tariffs being charged to those on 'key' or 'smart card' meters, and the worrying possibility of large numbers of 'self disconnections'.

The final presentation took the middle ground between the two previous speakers. The market, he pointed out, is complex, and generalisations and definitions are sometimes misleading. For example, capital constraints shouldn't be dealt with as market imperfections: they are barriers. He also pointed out that 'efficiency' has vastly different meanings for engineers and economists.

During the ensuing discussion session, Brenda Boardman of the Environmental Change Unit at Oxford University made the point that, whatever your point of view, there seemed to be a consensus that investment in housing stock is necessary, and with a Fossil Fuel Levy worth £1.25 billion, money is available, and only the political will is needed to divert it to where it is most needed.

Whether you are an engineer or an economist, an investment in housing stock, saving millions of £ annually in NHS costs, has to be seen as an efficient use of funds. □

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Infrared thermography and district heating

THE DISTRICT heating system employed by the City of Westminster Council serves over 3000 houses and flats over an area of four square miles. Some of the cast iron pipework is now over 20 years old, and problems such as corrosion are not uncommon.

The cost of corrosion is not only in the amount of water lost from the system. To ensure that each block of flats receives water at about 30°C, the water which is pumped into the system must be heated to at least 80°C. The cost of heating water which never reaches the end customer is clearly expensive. In addition, the water which escapes can also cause further damage to the pipework, attacking the insulation which surrounds the pipes, resulting in further heat loss.

To maintain such a vast network, the council must be able to locate such faults accurately and quickly. Before the advent of thermographic inspection techniques, this could only be achieved using a rather crude technique whereby maintenance engineers would look at the evidence of dry spots on the ground after a heavy rainfall — indication of localised heat leakage warming up the ground. Alternatively, engineers would compare the inlet water temperatures around the system for different blocks of flats — if any temperature was significantly lower than another, there was a chance that hot water might be escaping from the network just prior to entering the building. Either method was clearly not very reliable and it wasn't long before the City of Westminster turned to thermographic techniques to survey their district heating system.

Thermographic inspection works on the principal that all objects emit electromagnetic radiation in proportion to their temperature. Normally invisible to the naked eye, such radiation can be detected using an infrared scanning camera which converts incident radiation into an electronic signal which, after further processing, can be reproduced as a thermal image of the object.

The advantage of infrared thermography for the council is that it allows operators to scan wide areas of terrain very quickly, pin-

Leading thermographic consultants, Deritend Electromechanical Services of Luton, were recently called in by Westminster City Council to try and locate a fault in their district heating network, which was allowing 12 000 gallons of hot water per day to escape from the system. Using a portable thermal imaging camera it took just two hours to locate the leaking pipeline.

pointing localised hotspots caused by hot water leakages several feet under the ground. By employing the services of a trained thermographic consultant from Deritend, particularly one experienced in carrying out surveys of district heating systems, Westminster City Council could be assured of receiving a full and accurate report on the quality of their system.

Mark Smith, thermographic inspection technician at Deritend explains what he found when he carried out the survey commissioned by Westminster City Council to find the suspected fault.

"Accompanied by a council employee with a plan of the district heating system, it wasn't long before I located two hotspots underneath two cars in a parking bay near a block of flats. After checking the temperature of the exhaust and the underside of the

car engine, it was apparent that the hot spots were probably not being caused by heat reflected from a recently used car engine — a possibility that the inexperienced operator is not always aware of. Nevertheless it was essential to make sure that the hotspots remained even after the cars had been removed. So the owners of the car were sought whilst I carried on with the rest of the survey."

No other problems came to light as Mark completed the rest of the survey. On returning to the parking lot, one of the cars had been removed by its owner and he was able to carry out a fuller investigation. Using a Thermovision® 470 camera from AGEMA Infrared Systems, he produced a thermal image which showed the temperature at the centre of the hot spot to be 9.4°C. A reading taken at the outer edge of the hot spot gave a temperature reading of 8.1°C, with the temperature of the surrounding area being 5.3°C. The difference, 4.1°C, was more than likely to have been caused by hot water leakage under the ground at this point.

To confirm his prognosis, Mark carried out an inspection underneath the other car which it had not been possible to remove. A temperature difference of 3.3°C was found in this case. In preparation for his report, he stored thermal images of the problem areas on disk, and took visual images of the corresponding areas using a digital still camera.

Using a thermal imaging analysis and report software package supplied by AGEMA, Mark was able to provide a full report on his results for presentation to

		Results				
oC	10000300.004	10/02/94	11:31:41			
		Temp				
SPO1	9.4					
SPO2	8.1					
SPO3	5.3					
SPO4	9.2					
	Min	Max	Diff	Avg	Med	Sd
LIO1	7.3	9.7	2.4	8.4	8.1	0.7
	Diff	Formula				
DIO1	4.1	SPO1 - SPO3				



Westminster City Council the next day.

Following the report, Westminster City Council requested a more in-depth inspection of the problem area, digging up the ground to find out if there was in fact a leak at this point. On finding this to be the case, they were then able to reroute the water away from this point, at a time convenient to everyone, and carry out maintenance on the pipework as necessary.

Whilst this thermographic survey undoubtedly saved Westminster City Council considerable expense, Deritend are cautious about recommending its use in every case. Whilst the thermal imaging camera that they employ is extremely easy to use, some knowledge of the principals involved is necessary to ensure that 'false positives' do not arise. For example, the emissivity of an object (represented as a ratio which compares the amount of radiation emitted by an object, and hence its apparent temperature, with a true black body, equal to one) which is being inspected can have an important bearing on the results —

an incorrect setting may lead the operator to believe he has located a hot spot when one does not exist. In a district heating survey, for example, Deritend operators recommend typical emissivity values of 0.89 for tarmac, 0.92 for concrete and 0.95 for wet soil.

Likewise, the success of a thermographic survey depends on the thermal imaging system chosen to carry out the survey. For example, the sensitivity and accuracy of the camera are particularly important in monitoring pipework several feet underground as some leakages may only cause minuscule differences in temperature by the time they reach the surface. The Thermovision® 470 camera chosen by Deritend has a thermal sensitivity of 0.1°C at 30°C.

The ability of the camera to store images on disk on location is also important as these can be recalled by Deritend after the survey for further analysis. As a consultancy, Deritend find the ability to produce reports quickly and easily extremely beneficial as it allows them to spend less time in the office

and more time in the field with the customer. The IRWIN thermal imaging software supplied by AGEMA is particularly easy to use, and allows Deritend to produce professional colour reports including visual and thermal images with some basic analysis such as spot temperatures, temperature profiles and difference temperatures.

Bob Edwards, sales manager who was responsible for introducing infrared thermography at Deritend in Luton, says the Thermovision® 470 camera has more than paid for itself. Whilst the standard justification for purchase requires a payback period on new equipment within 10 years of purchase, he believes the camera paid for itself within 18 months of use at the company.

For further information please contact AGEMA Infrared Systems, Arden House, West Street, Leighton Buzzard, Bedfordshire LU7 7DD. Tel: 01525 375660; fax: 01525 379271. □

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BY COMBINING two existing, virtually energy-free, technologies Monodraught of High Wycombe in Buckinghamshire have come up with a highly innovative — and environmentally friendly — product, called 'SunScope'.

SunScope is an ingenious combination of Monodraught's 'Windcatcher' — a natural ventilation system, based on the balanced flue principle — and incorporates a natural light device from Canada, known as 'SunPipe'.

The Monodraught vertical balanced flue and natural ventilation system has been around for three decades. It was invented by William Shanks to suit open-fire type applications, and required a balancing chamber to be constructed behind the fireplace. It was subsequently developed to suit the domestic boilerhouse and has been used extensively throughout Eastern countries, where it is commonly known as 'Shank's flue'.

Before the balanced flue system was developed, it had always been necessary to take the flue of any boiler to above the highest part of the roof, to avoid problems of downdraught. Conversely a fan dilation system, or mechanically-assisted flue venting at low level was designed to overcome the problem of potential downdraught.

Supplying light and ventilation — naturally

The Monodraught system, however, provided a natural draught vertical balanced-flue system, which, by its very design, eliminates all possibility of downdraught without having to rely on mechanical means of operation.

By taking air through intakes sited at the top of the chimney, and passing it down through ducts formed in the sides of the chimney system to an enclosed boiler room, a balanced condition is created. The flue gases are contained in a highly insulated twin wall flue system, passing through the centre of the Monodraught arrangement, usually rising directly from the boilers.

Any air movement, no matter how slight, is encapsulated by the air intakes on the

windward side of the chimney and conveyed to the boilerhouse below. Any excess wind pressure is vented on the leeward side of the system, leaving the optimum operation of the appliance unaffected by wind turbulence.

Downdraught conditions on a conventional chimney/boiler house arrangement occur when the flue exit is subjected to a higher pressure than the air inlets to the boiler house. This pressure differential will normally be overcome by extending the height of the conventional chimney to above the level of any adjacent roof areas to create the additional buoyancy necessary to overcome the downdraught problem.

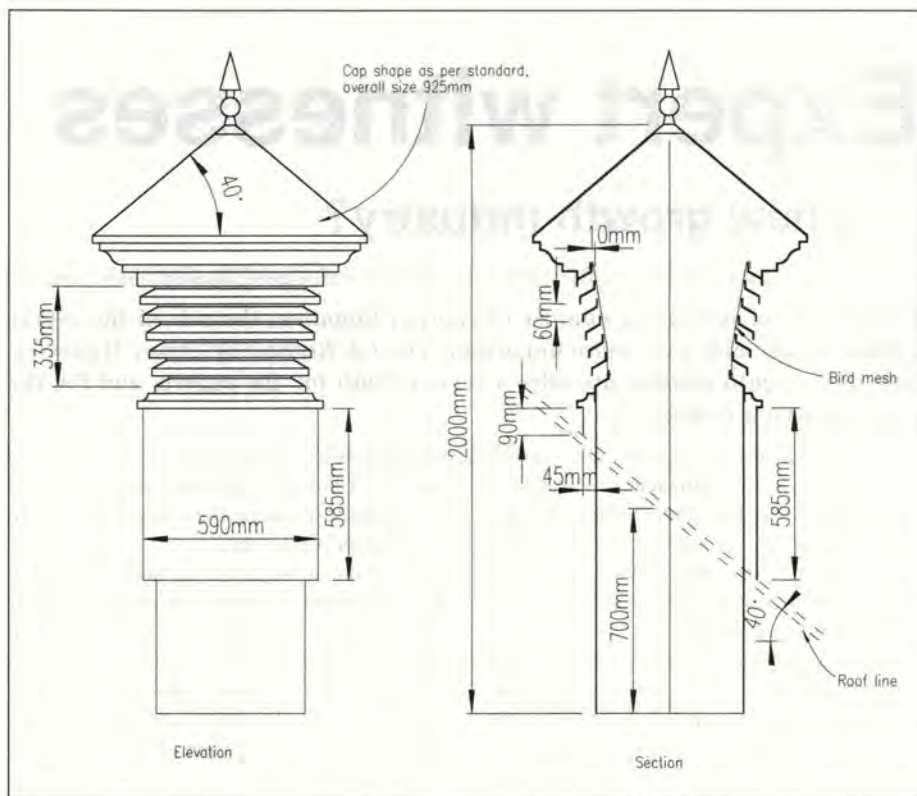
With a Monodraught flue terminal, the external flow pattern is always such that the pressure at the top of the flue exit is less than the stagnation pressure which occurs at the windward side inlet. No matter which way the wind is blowing there will always be at least one air intake subject to wind pressure, with the air ducts on the opposite side of the chimney acting as permanent ventilators.

The air inlet/ventilation ducts will be constantly changing according to wind conditions, with the boiler house acting as a 'balancing chamber' to equalise these pressure variations at the head of the chimney. The monodraught system has been used extensively in hospitals, schools and colleges, supermarkets, sheltered housing schemes, airports and leisure centres.

Over the 30 years since its invention, the Monodraught balanced flue has undergone several design modifications. The latest development is the 'lantern' style windcatcher, for natural ventilation, which eliminates the possibility of moisture entering the system through the louvre slats at the top: they graduate inwards in a lantern shape, preventing even 'horizontal' rain from seeping in.

Such ventilation systems can now be combined with a technology from Canada that will provide natural lighting, in addition to natural air conditioning.

Developed, and now very popular, in Canada, SunPipe is an idea of even greater simplicity than the windcatcher. The SunPipe consists of a clear, acrylic roof-mounted



The 'lantern' style Windcatcher provides natural ventilation, while each louvre profile forms a 'drip tray' to the louvre above, ensuring that under the most exposed conditions, the lantern is able to ensure the elimination of rain ingress, no matter how severe the exposure.



The SunPipe blocks 99% of UV rays, virtually eliminates solar gain and stops heat loss in winter months.



Left, a room illuminated during the hours of darkness, using normal electric lighting; right, the natural light afforded by the SunPipe is far brighter.



dome with a highly-polished aluminium tube, which can extend as far as seven metres to the room below. Sun shine or daylight is reflected and intensified down the super-reflective internal coating. The SunPipe terminates in an opaque diffuser at ceiling level, which distributes the light evenly around the room. There are two sizes of dome, the smaller, 330 mm in diameter, can illuminate a room space of 225 sq ft during daylight hours — suitable for domestic applications; while the larger, 530 mm in diameter, lends itself to commercial and industrial-scale

uses. Unwanted solar gain is eliminated during the summer, while in the winter the heat loss of roof windows or skylights is virtually eliminated, due to the internal tube of still air. The UV protected acrylic dome blocks harmful rays, and reduces the risk of fading

The system has its limitations. Light is only available during daylight hours, and can only be supplied to rooms seven metres or less below the roof. But nevertheless, the energy-saving potential of SunScope in certain situations is great. □

REGISTER OF EXPERTS

THE *UK Register of Expert Witnesses* is a 'live' database of expert witnesses and expertise, from which an annual directory is produced. Published by a partnership of scientists and lawyers, the UK register meets a long-felt need for a single source of information about expert witnesses.

The register defines an expert witness as an individual who has been instructed by a solicitor, or similar professional, to use his or her expertise to give an informed opinion, and/or to settle a dispute.

An independent company, J S Publications, was formed in 1998 solely to manage and publish the *UK Register of Witnesses*. Now the register has evolved to its present eighth edition size of 2000 expert witnesses indexed on more than 10 000 subjects. The company maintains a database of more than 2000 experienced expert witnesses, and a secondary database containing over 3000 experts willing to be instructed.

The register collects together experts from a wide range of disciplines, and each entry is

Expert witnesses

— a new growth industry?

In a climate of increasing number of cases of litigation, the role of the expert witness is becoming ever more important. The *UK Register of Expert Witnesses*, now in its eighth edition, provides a service, both for the experts and for the solicitors who use them.

based upon the recommendation of at least one solicitor who has actually been instructed by the expert concerned. In almost all cases the expert has been in the witness box and proved themselves competent as a witness, as well as an expert.

Any expert who has not been instructed as an expert witness can be included on a separate database of experts willing to be instructed, which is consulted when the expertise cannot be found in the central database. In addition, there is no charge for being included on the back-up database.

The main annual edition of the register is published in April, with a supplement pro-

duced in October, which lists all experts who have passed through the vetting procedure since the previous April.

There are substantial benefits to be gained from inclusion on the *UK Register of Expert Witnesses*. Your details will be placed in front of active litigation professionals, who both value and trust the database. You will also have access to expert witness colleagues from a wide range of expertise. The register is sold primarily to litigation solicitors and barristers, as well as trading standards offices, patent agencies, County Councils, law libraries and insurance companies, but it is not sold direct to the public.



Almost a third of the experts listed in the latest edition practice medicine or dentistry, which in turn reflects the considerable increase in recent years of personal injury litigation and claims alleging professional negligence. But the publishers are always pleased to hear from suitably qualified specialists in any field who are experienced in the requirements of litigation. Several members and fellows of the Institute of Energy are already included in the register as expert witnesses.

In May this year J S Publications distributed a questionnaire to a large sample of the experts who have entries in the latest edition. Of the 1341 questionnaires mailed, 451 were returned — a response rate of 33.6%. This number of replies is easily large enough to permit a statistical analysis of the answers provided. One of the most remarkable features of the survey is the uniformity of the statistics across the whole range of those questioned. Time and again the same results emerged, regardless of the length of time those replying had been engaged in expert witness work, and workload it engendered for them, or the amount of expert witness training they had received.

Overall those replying to the questionnaire were very experienced. Around 60% had been undertaking expert witness work for more than 10 years, and a further 31% for between five and 10 years. On the other hand, only one in five categorised it as their principle activity, and for half of them it accounted for less than one fifth of their workload.

More interesting still, the great majority — 82% — foresaw their involvement in expert witness work as increasing in the future.

The experts were asked how many enquiries they had received from instructing solicitors during the previous 12 months, and their replies revealed widely differing levels of demand. At one end of the scale 5% reported no enquiries during the period, while at the other end, 28% reported to have had more than 25. The median figure was 10 enquiries over the 12 months.

Questions posed under the heading 'frequency of instruction' distinguished between those instructions to write expert reports and those requiring evidence to be given in court or before a tribunal or inquiry. As expected there was a much greater incidence of the former, with 27% of those replying having written more than 25 reports during the previous twelve months, but only 2% having made that many court appearances. Indeed, almost 35% of the experts completing the questionnaire had made no court appearances at all during the period.

The median levels of activity were, for writing reports, between six and 10 instructions, and for giving evidence in court, between one and five.

A number of questions touched on the business side of being an expert witness, and it had to be said that they produced some disquieting answers. 43% of the respondents did not routinely ask enquirers how they came to hear of their expert witness capabilities. 68% had no standard form of contract for use when accepting instructions; and 41% did not even stipulate by when their fees should be paid. This is all the more surprising when one considers that the great majority of expert witnesses are professional people used to dealing with clients in a business-like way in their other spheres of activity.

Further answers on the topic of payment for services rendered revealed an even more lamentable state of affairs. Only 32% of those experts who stipulated payment of their fees within a fixed period were able to report that the solicitors instructing them settled on time in even the majority of instances, while a staggering 41% claimed that solicitors did so in less than one case in four. 52% of the 346 respondents who accepted instructions in legally-aided cases reported that in at least half of them solicitors excused delay in paying fees on the grounds that they had yet to be reimbursed themselves by the Legal Aid Board — a situation which need never arise if solicitors claimed for expert witnesses expenses in good time.

The survey asked a number of questions about training, and whether more might be welcomed. It is no doubt to be expected that the majority of expert witnesses have received no formal training in either the requirements of litigation, or how to conduct themselves in court. It is, after all, only in the last few years that courses have been devised for this purpose. Indeed, in such circumstances it is commendable that 43% of those returning the questionnaire had already taken advantage of such a course. The unanimous answer to the subsidiary question: 'was the training of value to you?' was 'very much so'.

Turning towards future training requirements, 39% of respondents expressed an interest in attending day courses on court techniques, and 37% said they would be interested in renting training videos on the same topic.

Just 26% of the experts who answered the question about the professional organisations they belonged to mentioned any that catered for their needs as expert witnesses, and even this may overstate the position for expert witnesses in general. Thus, while 16% of experts who returned questionnaires said they were members of the Academy of Experts, only 10% of those listed in the *UK Register of Expert Witnesses* cite membership of that body among their post-nominals. This suggests that fewer than one in five of the experts in the register currently belong to any organisation related to their expert wit-

ness work.

Yet it is abundantly clear from the answers to the question 'would you be interested in joining an informal association for the purposes of exchanging information, promoting training and establishing standards?' that such a body could meet a real need. No fewer than 276 of the 451 replying (66%) answered 'yes', and 119 of them further indicated that they would be willing to play an active role in the association's formation. Intriguingly, this enthusiasm was shared in like measure by respondents who already belong to other relevant organisations — in their case 63% replying in the affirmative. Even for them, it would seem, their needs as expert witnesses are not being fully catered for.

Until recently there was no simple way for an expert witness on the register to indicate that they were included. That has now changed with the introduction of the register logo. This provides a convenient means to demonstrate expert witness credentials on stationery, reports and any advertising material that might be produced. J S Publications can supply the logo in three forms: as rolls of transparent stickers, which come in three different sizes; as bromide artwork, enabling the expert witness to incorporate the logo into their letterhead; and electronically in four common formats: Windows bitmap (.BMP), CorelDRAW!5 (.CDR), placable postscript (.EPS) and the industry standard TIFF format (.TIF).

J S Publications are always looking for ways to enhance the service offered by the *UK Register of Expert Witnesses* — both to the expert witness and to the many solicitors who use the register.

The newest project involves circulating to litigation lawyers vital kernels of information on familiar topics which may be useful to them when considering how to approach a particular case, but which would be difficult for them to come by with first referring to specialist or technical publications. The best sort of *Nota* will alert the solicitor to a particular aspect of a case which might not be immediately obvious, but which could be the one on which the result turns.

The information will be distributed in the form of cards, which it is planned to mail to subscribers at regular intervals.

All members of the Institute of Energy who have provided instructing solicitors with reports or given expert evidence in court are eligible to apply for inclusion in the register. Anyone interested in doing so may write for further details to J S Publications, P O Box 505, Newmarket, Suffolk CB8 7TF (fax: 01638 560924) or telephone 01638 561590, and ask to speak to the Publications Manager, Sandra Barrow. □



Benefiting from contract energy management

AS HEATING and process plant feels its age and the costs of different energy sources fluctuate, the option of renewing systems becomes very desirable. However, with major capital investment required to implement the most modern and efficient systems, the decision to change is often put off.

As a result, businesses and property managers are missing out on the benefits of new technology — centralised boiler systems are retained in favour of more appropriate heating systems. Also, automatic remote control and monitoring appears prohibitive. But with reducing costs for natural gas, and energy management specialists financing and operating complete energy systems on site, companies can now take advantage of state-of-the-art heating and process equipment without making major capital investment themselves.

Kinetica Energy Management advises clients on how to minimise their energy costs by installing the most appropriate proven systems to suit their application and using the most suitable energy source. Moreover Kinetica can finance complete schemes, enabling clients to make savings on annual energy bills without any initial outlay. Once the system is installed, it is controlled and monitored automatically on site and remotely by Kinetica's bureau.

A typical example is blocks of flats run by local authorities or property agents. It is not uncommon to find coal or oil-fired boilers which are old, inefficient and dirty, costing far in excess of an optimum system. Kinetica might recommend a conversion of the central boilers to gas which is both cleaner and cheaper, and to supplement the heat output with a combined heat and power unit which also serves to generate electricity. In doing this, annual savings will be sufficient to cover initial capital investment and still reduce ongoing running costs.

An industrial example is Dexion Ltd, the industrial storage specialist, who contracted Kinetica Energy Management to design, install, operate, manage and comprehensively maintain new gas-fired space heating and process heating systems, new lighting systems, compressed air plant, all controlled by a computerised energy management system over a ten year period. The project finance was provided by Kinetica and amortised

through guaranteed annual savings over the agreements term. The new and efficient system provides improved environmental conditions, meets current legislation and improves product throughput at the plant.

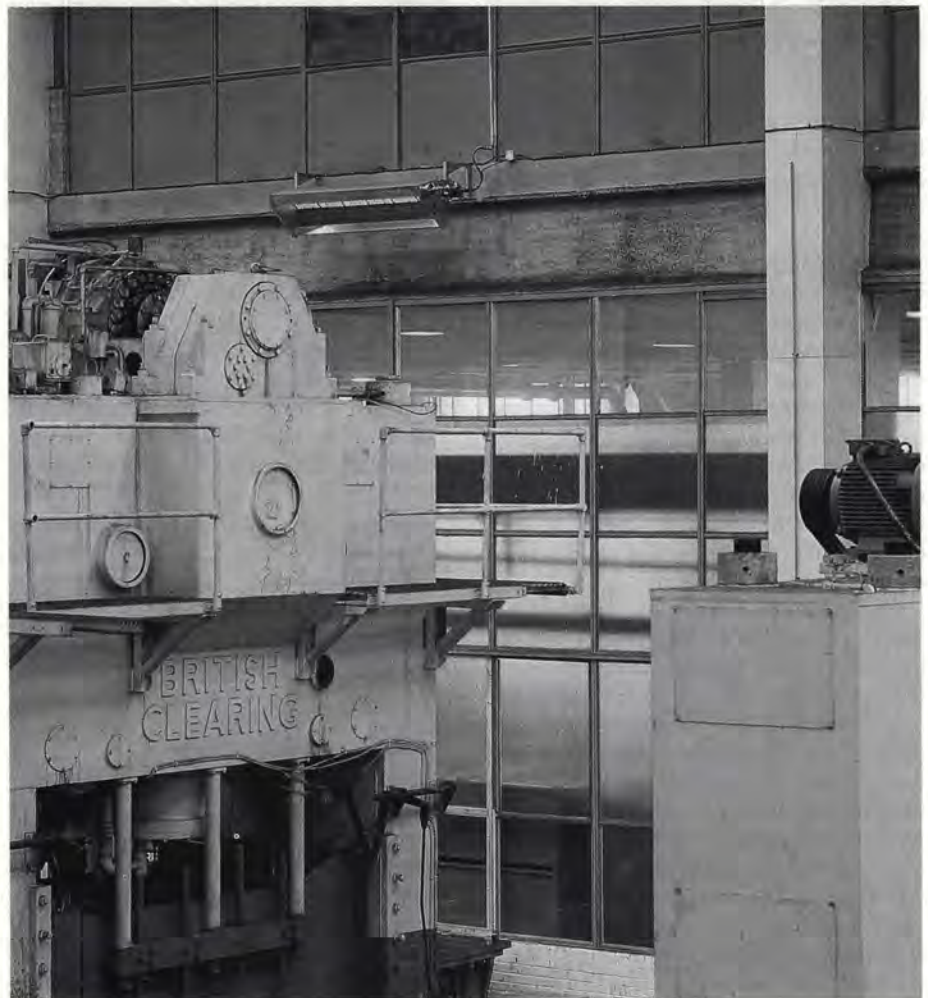
Kinetica Energy Management has also provided a new heating system to Coventry Presswork for no capital cost with guaranteed savings of over 15% in annual heating costs. In the first year the system has achieved savings of an additional £25 000, the majority of which was passed to Coventry Presswork.

The scheme, involving modern heating equipment minimises losses and maximises heating efficiency at the point of use. According to Tony Ellis, financial director of Coventry Presswork, "The energy management element was as important as the benefits of new heating. The dynamic nature of our business required that we concentrate our resources to satisfy the demands of our customers at all times. The Kinetica package

provided significant benefits with minimal risk."

The contract at Coventry Presswork also included new compressed air equipment, the installation of a number of rapid roll doors for air movement control and air conditioning to office areas. The systems are all controlled by on-site micro-processor driven monitoring, which is duplicated remotely at one of Kinetica's regional offices. Kinetica's 24 hour bureau uses its own state-of-the-art systems to manage industry standard controllers installed at client sites all over the country.

So, while clients have local control, they are assured that Kinetica has a supervisory role which ensures the installation performs fully at all times. Due to the success of the project, further areas have been identified and incorporated by Kinetica as a result of changes required by Coventry Presswork in its manufacturing facility. □



Factory interior at Coventry Presswork.



CREATEing links with tomorrow's membership — new initiative

MANY readers will be aware of the Institute's role in establishing and supporting the Centre for Research, Education and Training in Energy, more commonly known as CREATE. When the organisation was first set up in 1988 to coordinate and promote energy education in UK schools, it occupied the top floor of 18 Devonshire Street, enabling it to work very closely with the Institute staff.

In 1990 CREATE became a registered charity and moved its operation northward, initially to Colwyn Bay and in 1993 to Wigan. In September of that year CREATE was featured in *Energy World* and has continued to flourish ever since, with support from the Department of the Environment, industry and of course, the Institute.

Both the Institute and CREATE have maintained regular contact, mainly through the Education and Training committee (E&T), of which Don Carey, CREATE's chairman, and Bob Buckley, the Institute's representative on CREATE Council, are members. CREATE working with the Institute is a regular item on the E&T agenda.

Such contact recently led to CREATE carrying out a review of other institutions and associations' educational activities. The outcomes were presented to E&T for consideration and, as a result, a development plan to improve the Institute's liaison with schools has been proposed.

The plan has a number of aims within the field of energy education:

- to raise the profile of the Institute's support for schools and colleges;
- to encourage the Institute's support for 16-19 education in energy;
- to inform students on energy matters;
- to raise awareness of the benefits of Institute membership to potential future members
- to encourage present Institute members to liaise with schools and colleges in their local community;
- to use CREATE's school contacts to develop the Institute's liaison with schools;
- to provide guidance for members to enable them to achieve the above.

As a first step it has been agreed that a schools liaison information pack be prepared

and made available to those members wishing to develop links with the educational sector. But rather than rushing into producing something that is not appropriate, the Institute and CREATE would welcome your views on what the pack should comprise. For example, if you wish to give a lecture to A level students at a local high school or seek to advise the school governors on energy management, what sort of advice would you like to see in the pack? A number of suggestions have been detailed on the form below and it would be appreciated if you could prioritise the proposed contents. In addition, some readers may have already developed close links with schools. If so, details of your activities could be valuably used as case studies to include in the pack (please forward your experiences for consideration!).

It is intended to implement the development plan as soon as possible, so a prompt return of the form would be much appreciated. Both the Institute and CREATE are sure this will be a very worthwhile exercise for all concerned and your support is most welcome.

National standard for energy management

WITH support from the Institute of Energy and British Gas plc *The Good Energy Manager's Guide* will be published on 30 November by the Management Charter Initiative, for sale at a special discounted price of £10.00, available from the Institute's stand at NEMEX '95 in Birmingham from 5-6 December.

Based upon long awaited new National Occupational Standards for Managing Energy, this guide translates the standards into a user friendly, easy reference series of checklists which will allow energy management personnel to work towards a nationally recognised and acknowledged benchmark.

Mr Michael Roberts, past president of the Institute, and director of MCR Energy, commented upon the guide as "an excellent piece of navigation through the National Standards for Managing Energy; a valuable tool for every energy manager".

The guide provides What To Do checklists against every area of the energy management function as prescribed by the new standards, and also includes a section covering operational management extracted from the suite of general management standards which exist at three levels: first line, middle and senior management. With the standards in place the project partners are moving forward to develop NVQ units and qualification for energy managers at NVQ level 4.

Schools Liaison Information Pack

Please prioritise the suggested components (1-6)

- Synopsis of energy content of current A level and GNVQ syllabuses
- Directory of university energy courses
- Guidance on how to approach schools
- Framework and suggested approach of presentation
- Case studies
- Institute promotional material for schools

Please return form to
CREATE, FREEPOST (WN5324), Kenley House
25 Bridgeman Terrace, Wigan WN1 1ZZ



Branch events

S Wales & W of England

Tuesday, 14 November, from 6.30 pm

'The certainty of uncertainty, or assessment of the impact of cheap gas and combustions emissions legislation on heavy fuel oil use' by Mike Drew. At University College Cardiff, Seminar Room 2, Trevithick Building. Contact: M Biffin, tel: 01443 482231.

Yorkshire

22 November, from 6.30 pm

'Energy and the environment' by Dr William Wilkinson CBE, chairman of British Nuclear Industry Forum. At Leeds University, Rupert Beckett Lecture Theatre. Contact: Mr Mallalieu, tel: 0113 2768888.

S Wales & W of England

Tuesday, 28 November, from 7 pm

Social event: Ghost Evening. Llancaich Fawr, Nelson Mid Glamorgan. £7.50 per ticket, friends and relatives welcome. Contact: Mr Biffin, tel: 01443 482231.

December 1995

Headquarters

3-5 December, two-day event

Second International Conference on COMBUSTION & EMISSIONS CONTROL, Commonwealth Institute, London, W8. Contact: IChemE, tel: 01788 578214.

NEMEX '95

5-6 December, Metropole Hotel, Birmingham. Contact: Louise Evans, tel: 0171 580 7124.

Midland

Thursday, 7 December, from 6.30 pm

'The Didcot combined cycle power generation scheme' by Mr N Orchard, station manager, Didcot Power Station. Snr Common Room, Aston Birmingham University. Light buffet at 6.30 pm, lecture commences at 7 pm. Contact: Mr D E A Evans, tel: 01384 374329.

January 1996

Northern Ireland

6 January

Visit to NIGEN, Kilroot Power Station. Contact: Dr Patrick Waterfield, tel: 01232 364090.

Midland

Thursday, 11 January, from 6.30 pm

'Buying electricity in the contract market' by Mr M Warrander, Utilities Coordination

Executive, Allied Domecq Ltd, Snr Common Room, Aston University, Birmingham. Light buffet from 6.30 pm, lecture starting at 7 pm. Contact: Mr D E A Evans, tel: 01384 374329.

S Wales & W of England

23-30 January

'Sainsbury's Energy Manager', Mr I Williams, senior manager, Sainsbury's. Contact Mr Biffin, tel: 01443 480480.

February 1996

Northern Ireland

Date to be confirmed

PV in buildings dissemination seminar. Contact Dr Patrick Waterfield, tel: 01232 364090.

Midland

Thursday, 1 February, from 6.30 pm

'The relationship between global warming and energy usage' by Mr J Wright, Birmingham Centre for Climate & Atmospheric Research. Snr Common Room, Aston University, Birmingham. Light buffet from 6.30 pm, lecture starting at 7 pm. Contact: Mr D E A Evans, tel: 01384 374329.

Scotland

6 February, from 6.30 pm

'Young Engineers Evening' Napier University, Merchison Campus, 10 Colinton Road, Edinburgh. Contact: Mr Hannah, tel: 01389 765177, ext 348.

Yorkshire

Wednesday, 21 February, from 2.00 pm

'Hazards of Offshore Rig Operation' by Mr J King, held at Leeds University. Contact Mr Mallalieu, tel: 0113 2768888.

S Wales & W of England

21 February, from 11 am

Visit to Spirax, Cheltenham. Reserve places by contacting Mr Biffin, tel: 01443 482231 at University of Glamorgan.

March 1996

East Midlands

Date to be confirmed

British Oxygen, Scunthorpe. A tour of the works. Contact: Mr M Allen, tel: 0115 9815879

Yorkshire

Date to be confirmed

A visit to PowerGen's Killingholme gas-fired power station.

Contact: Mr Mallalieu, tel: 0113 2768888

Midland

Thursday, 7 March, 7 pm

Branch visit to Messrs Smith, Stone and Knight Paper Mills, Birmingham. Evening visit starting at 7 pm.

Contact: Mr D E A Evans, tel: 01394 374329

Yorkshire

12 March, from 7.30 pm

Held at Cedar Court Hotel, Wakefield. Joint meeting with the Institute of Petroleum.

Topic to be advised.

Contact: Mr Mallalieu, tel: 0113 2768888

S Wales & W of England

Wednesday, 13 March, from 5.30 pm

Young members' technical papers. Evening, graduates and students compete for prizes by presenting an energy-related project.

Prospective contestants should contact: Mr Biffin, tel: 01443 482231.

Obituary

Bryan Emes

IT IS with regret that we announce that Bryan Emes, BEM CEng FInstE, passed away on 5 September 1995, aged 68 years.

Bryan joined the Institute in 1956 as an Associate, becoming a full member in 1964, and was elected Fellow in 1974. In 1970 he became chairman of the Midland branch, and his chairman's address on the subject of: 'Reheating and Heat Treatment in the Aluminium Industry' was not only well received but reflected his particular interest in energy utilisation, which resulted in his cofounding Mechatherm Engineering Ltd in 1973 with L F Riley and J Gardner.

In his work Bryan made significant contributions to extrusion technology in aluminium billet and log heating, and the associated hot shears, ageing ovens and their automation, to the development of the rotary die oven and in log homogenising techniques. However, he still found time to serve on the Institute's membership committee, for which, and for his contribution in general, he was presented with the Institute's Recognition of Services Award.

Although Bryan went into semi-retirement in 1992 — ill health clouded his last years — he was one of life's great achievers, and experienced considerable success both in his business and personal life, making many friends in the process. Our sincere condolences to his widow Mavis and son Christopher.

D E A Evans

Hon Secretary, Midland branch



Accessible to the lay person

'Independent Energy Guide' by Kevin Jeffrey. Published by Chelsea Green (USA), UK distributors: Images Booksellers & Distribution Ltd, October 1995, 256 pp, £15.95.

THIS book is a practical guide, designed for the lay person, on how to install your own small-scale, independent electrical power supply for home, boat and recreational vehicles. As such it carries all the technical information necessary and the appendices include a sampling of power equipment; a list of system retailers; suggested further reading; as well as sections on wiring and conversions.

Faced with the choice of using renewable power sources, or conventional engine-driven ones, the author tends to argue the case for renewables: not only because of their environmentally sound credentials; but also because the technologies are innately simple; with the additional benefit of not having to buy or store fuel (particularly important for boats and recreational vehicles).

The guide begins with 'The Basics', providing a brief history of energy use, and examines the pros and cons of the main options available for small-scale power supplies.

Part Two looks at DC charging sources, with an in-depth look at PV solar panels, wind-powered generators, water powered generators, engine-driven alternators, portable generators and DC chargers, and AC to DC battery chargers.

The third section deals with AC power systems from inverters and direct power sources. Also dealt with are battery and charging techniques; monitoring and methods of using power most effectively.

The author, Kevin Jeffrey, has worked as an alternative energy designer, builder and writer for 20 years. His book is clear, highly readable, and packed full of useful information. If you are asked to recommend a book for the non-engineer, seeking to install their own small-scale power supply, you couldn't go far wrong with this one.

Impressive — for a first attempt

'Guide to CHP and on-site generation' by C L Escombe, G C Smith and F M Escombe. Published by ERA Technology, 1995, ERA Report 95-0001, Project 12-02-4741.

DESPITE a formidable 106 pages of editorial text and a further ten sections of commercial data, amounting to another 300+ pages, it should be relatively easy to paint a child's

picture of a guide to CHP.

This appears to be the first essay of ERA into a realm hitherto virtually non-existent to its parent electricity industry. This is, however, a serious attempt to set out the pros, rather than the cons, of a technology belatedly receiving Government support and encouragement.

As a statement of the *status quo* virtually nothing deserves comment: the language is simple and every possible care appears to have been taken to avoid misunderstandings. But while the discussion of needs and means reflects both official opinions and attitudes, there are areas where statements could be disputed. Waste to energy is one such, where MSW incineration is discussed. As many would agree, the trend is firmly towards incineration, but as a 'key adjunct' steam for power generation is given as for power generation *or* district heating. In fact, as SELCHP was and remains intended, both must serve if the plant is to achieve maximum thermal efficiency. In Sheffield the reverse is the case: full heat use, no generation, although it is anticipated.

In stating the case for CHP there is an omission that should be corrected. Numerous CHP units, even large gas turbine installations, have been made where the prime concern, not mentioned here, is for uninterrupted power supply, safeguarding computer records, ensuring 24-hour constant voltage.

On the other hand there is the somewhat novel, but invaluable, advice on the operation of engine-driven plant, which can produce noise nuisance and can also suffer from excessive heat extraction causing condensation difficulties.

In any concept of use of CHP — and on any scale — the heat to power ratio is all important. The system design must aim at as close a match as possible between 24-hour demand and 24-hour production, even assuming a balance depending on heat storage. Hasten the day of super-conductivity storage of electricity.

This ERA Guide to CHP appears to be weakest in its description of heat to power ratios of output for this size and type of prime mover. The choice before the designer is made from low to high-speed diesels, from aero-derivatives to static-designed gas turbines; back pressure, pass out (steam bleed) and condensing with combinations including combined gas and steam cycle production. No mention is made of geothermal.

Accompanying diagrams in this section depart from what many would consider standard practice. To speak of 'boilers', however, instead of the more familiar 'heat exchangers' may help the uninitiated, but should not be taken to represent new thinking.

If there is to be such a departure, it would help if terms such as 'waste heat' and 'con-

densing' were more fully examined. The whole object of CHP is to maximise both thermal and electrical efficiency. Any waste heat should be anathema — and stressed as such.

The commercial sections of this volume quote *verbatim* manufacturer's offers of equipment and services. These are so numerous as to warrant a corresponding detailed guide, of prime movers in particular. The heat to power ratio is too important to risk any mismatch; cross-referencing and a more detailed overall index to supplement the section contents would be much more helpful.

Congratulations are due to ERA for its realistic use of watts for both heat and power, avoiding the abysmal use and constant confusion of joules for heat. Why the BTU and therm have had to go in this context is deplorable. Incidentally, a simple explanation of enthalpy, entropy and exergy could do nothing but help — providing theory stopped at that. These terms have their uses: they should not be ignored.

The Guide appears to be a first and at times, hesitant, edition. Despite the niggles expressed here, it is a very excellent first attempt. The second will no doubt show a firmer approach and control of the subject. It is hoped that at least some mention will be made of UNICHAL and its enormous experience of the ultimate use of CHP in both local as well as city-wide heat and power distribution. There is too an opening for a much more extensive and comprehensive dissertation and design for combining low temperature (cooling) working with heat production and distribution. Unwanted heat removal can be a valuable input for feed to a heating system, justifying and bringing heat pumps into a region of high COP.

For those involved in any aspect of CHP technology this could be a very worthwhile *vade mecum*. ERA might consider selling this work as a two-volume production: not everyone needs the commercial data, which takes up so much space.

NJ

Back to the future

'SI The International System of Units' 6th edition, edited by Jim Bell, National Physical Laboratory. Published by HMSO, 67 pp, £7.95.

THIRTY years ago, a government fired by modernising zeal decided the country should turn metric. A period of ten years was deemed sufficient for most branches of the economy to become metricated. But since the heady days of the mid '60s, the timetable has lost its momentum. Currency decimalisation in February 1971 gave renewed credence to latent fears and in 1980 the Metrication Board, the official engine of



change, was unceremoniously abolished. Later, Mrs Thatcher delivered a typical Iron Lady 'non' when the treasured pint and the mile came under threat.

At long last, however, the nation's high streets have succumbed to metrication and to celebrate the Occasion, 1 October was dedicated M-day. Reported research about possible consequences of metrication for retailers and their customers threw up, in passing, that the supposedly displaced Imperial system still rules in many of the UK's smaller technology-based enterprises.

The 6th edition of the *SI The International System of Units* is not just important for myopic practitioners of the Imperial system. It is a faithful translation of the latest French language text of 1991 and an important updater for energy technologists for whom the modified recommendations affecting electrical quantities will be of particular interest.

The book provides a definition of the International System of Units and an explanation of its use. A chronological history includes all the relevant decisions promulgated since 1889 by the General Conference on Weights and Measures (CGPM) and of the International Committee for Weights and Measures (CIPM). The current definition of all the SI units and the measurements that can be made to realise them are given.

The latest edition is a revision of the 5th UK edition of 1986. It embraces the decisions of the 18th CGPM (1987), CIPM decisions taken in 1988, 1989 and 1990, and amendments made by the Consultative Committee for Units (1990). The principle revisions concern the adoption of additional SI prefixes and modified recommendations for the practical realisation of the electrical quantities following the adoption of prescribed values for the Josephson and von Klitzing constants.

The National Physical Laboratory (NPL) has also published a useful pocket reference *Fundamental physical constants and energy conversion factors*. A well designed and informative poster has also just been published which illustrates how the SI base units, including the supplementary derived units for the plane angle and the solid angle, are realised at the NPL.

Lewis Tozer

Essential reading

'Energy for the future' edited by Sir Denis Rooke, Ian Fells and John Horlock. Published by E & FN Spon for the Royal Society, 1995, 225 pp.

THE relentless growth of the world's population, most of it occurring in the developing countries, and the legitimate drive of those nations seeking improvements to their stan-

dard of living, pre supposes an ever increasing demand for energy. The efficient utilisation of primary energy is paramount for providing greater assistance to the overwhelming masses in the world's poorer countries by fulfilling their expectancy of a more prosperous future.

The economic exploitation of the main global energy resources currently in use are finite and this is a prime factor in all debates concerning our present energy consumption, environmental aspects and efficient utilisation.

This book examines the ways in which human needs and expectations can be made available to all, being served by the ever increasing technological developments as we approach the 21st century. The very wide range of viewpoints advanced in the book's 11 chapters are by authors of international reputation, and make for essential reading for the many concerned with energy policy, its implementation, development and utilisation.

The contents represent the proceedings of one of a series of discussion meetings convened by the Royal Society. The range of subjects stretch from environmental damage by energy sources, to fossil power generation, sustainable development and nuclear power. Oil and gas utilisation and energy efficiency are topics very adequately covered, while the role of renewables is not forgotten. A complete chapter is set aside for considering the many aspects of how transport is affected by new technology and the search for better means of reducing the enormous problems created by congestion, pollution and accidents.

The chapter on renewables stresses the need to address the world's energy problems today in looking for cleaner energy sources. Despite the potential of renewables, there appear many barriers to seeing the advocates' dreams fully realised.

It is unlikely renewables can provide large amounts of clean power which the nuclear industry can command. However, the latter needs the appropriate incentives and a greater acceptance by the public confidence in its future. This book examines a number of other energy sources which if utilised can run alongside existing energy forms. It is much recommended.

Eur Ing F John L Bindon

Too little too late

'Energy Our Plight!' by Walter O Weber. Published by Pentland Press Ltd, Bishop Auckland, Durham, 109 pp, £8.95.

RECEIPT of this book caused the reviewer to compare it with *Energy: To Use or Abuse?*, published by Shell UK Ltd in 1976 as a sequel to our oil crisis — but how differ-

ent it is in presentation! The author freely admits that he is an enthusiastic prophet of doom, in particular on the subject of pollution to the planet by energy waste and energy in most of its forms. Much of the short book discusses pollution, and there is a section on alternative energy. Although all the professional engineers in the UK are already committed to conserving the environment, he is concerned that we are doing too little, too late.

There is no doubt that there is an international problem which needs to be tackled urgently, but the reviewer cynically suggests that, never mind the will, any mention of the large sums of money involved to change business activities will not generate the enthusiasm of politicians, and probably precious few votes for them to remain in office. A serious suggestion is made for return to in ground living, to reduce urban spread of housing. But more consideration is needed on this point, as it may generate worse problems than the now infamous high-rise dwellings.

A question and answer section makes very interesting reading. The ample glossary of 25 pages will help any confused reader to translate the frequent large numbers into one consistent set of units to be better understood than barrels, gallons (Imperial or US) and cubic kilometres! A constructive suggestion not included (which would at least please gas engineers) in a land of flowing natural gas, is that it would be cheaper to pass energy in pipes underground than to increase the height and number of overhead wires.

Nigel Gwyther

Recently published

'The Electrical Utilities of the World'

Published by ABS Energy & Power, 1995, 475 pp, £480.00. Further details from ABS Energy & Power, tel: 01344 291828; fax: 01344 291024.

'An Analysis of the Principal Manufacturers of Electrical Equipment & their Markets'

3rd edition. Published by ABS Energy & Power, 1995, 650 pp, £480.00. Further details from ABS Energy & Power, tel: 01344 291828; fax: 01344 291024.

'The Falklands Shelf — the South Atlantic Oil and Gas Frontier'

Published by Smith Rea Energy Analysts Ltd, 1995, £3500. Further information from Margaret Mannouch, Smith Rea Energy Analysts Ltd, Hunstead House, Nickle, Chartham, Canterbury, Kent CT4 7PL. Tel: 01227 738844; fax: 01227 738866.



'Clean' team win environment award

THE Engineering Council's prestigious 1995 Environment Award for Engineers has been won by a two-man team.

The accolade went to Stephen Maxwell CEng, and Ian Bernard from Cleveland Potash Ltd, Saltburn. Their project ensures that ship loading chutes discharge bulk so that no dust escapes. As well as the environmental health benefits, there is no possibility of charged dust particles causing explosions.

Their prize of £5000 and the Lloyd's Register Trophy were presented by the environmentalist Jonathon Porritt, Director of Forum for the Future. Jonathon Porritt said: "It is becoming more and more apparent that the engineering profession has a vital role to play in enabling all societies to achieve genuinely sustainable development. That alone should make engineering one of the most exciting career prospects open to young people today as exemplified in these environmental awards."

Sponsored by Lloyd's Register, British Aerospace and British Telecom, the engineering profession's top environment competition demonstrates how engineers are making positive contributions towards protecting the environment.

The award encourages engineers to demonstrate their skill and versatility in taking account of environmental issues when planning projects and finding solutions to environmental problems.

The second prize, of £1000, was awarded for the St Fergus gas-gas exchange project, developed by Keith Skerrow CEng, John Love CEng and Mike Rothwell CEng, from Total Oil Marine plc, Aberdeen. Their project is a method of chilling gas arriving from offshore without the use of the CFC Freon 12 as a refrigerant. This will ensure that some 30

tonnes of Freon 12 can be removed from the plant by the end of 1995.

Two further projects were highly commended, and received prizes of £500 each. The first was 'automobile exhaust gas ignition', the work of Dr Nicholas Collings CEng from the Department of Engineering, University of Cambridge. This is a project to reduce exhaust emissions that improves the environmental performance of cars fitted with catalytic converters. The development heats the catalyst in a few seconds from start by igniting a rich exhaust just ahead of the catalyst.

The second highly commended project is the 'Elephant' stabilised soil blockmaker developed by Arthur Laming CEng of Gillingham, Kent. This is a tool which can be used with ease — particularly useful in the developing world — to make durable, thermal efficient housing.

Mike Heath, director general of the Engineering Council, said: "The work of engineers in safeguarding the environment is a vital role that often goes unrecognised. I am pleased that the Environment Award for Engineers highlights this role and shows how engineers and technicians can produce cost-effective solutions to existing problems while continuing to care for, and protect the environment."

The 1995 award was open to individuals registered with the Council as chartered engineers, incorporated engineers and engineering technicians, or to teams of engineers and technicians including at least one member who is registered. Entrants had to be responsible for the design, manufacture or construction of an engineering project or process which provides an engineering solution to an environmental problem.

1995 Lady Finniston Awards announced

SEVEN young women are to receive bursaries for their academic studies as joint winners of the 1995 Lady Finniston Award. Presentations were made to the winners at the AGM of the award's organisers, The Women's Engineering Society, in Glasgow in September.

Female UK residents who have received an offer of a place on a UK undergraduate engineering course can apply for bursaries under the scheme. All applicants should intend to work in the UK as an engineer following graduation.

This year's recipients are Sharon Edwards, a single parent who will study mechanical engineering at Lancaster University; Frances Holden, who will study environmental systems engineering, also at Lancaster; Helen Houseman, going to study chemical engi-

neering at the University of Newcastle; Alina Kopric will read mechanical engineering at the University of Surrey; Mari Tomlinson, also reading mechanical engineering, at University of Reading; Jayne Crookall will study medical electronics at Liverpool; and Rachel Crates, who will read civil engineering at the University of Wales.

The Lady Finniston Award was established by the Women's Engineering Society (WES) following an initiative by Sir Monty Finniston, whose dying wish had been to establish such an award named after his wife. The purpose of the award is to provide additional funds for young women wishing to enter the engineering profession. The award is given to women whose financial circumstances mean that they would otherwise be unable to afford to study.

Salary boost for professional engineers

THE rising significance of engineering in almost every aspect of daily life is reflected in further salary increases for professional engineers and technicians, a recent survey shows. The income of professional engineers and technicians registered with the Engineering Council has risen substantially in real terms over the last three years.

Between 1992 and 1995 the average pay of chartered engineers rose by 12.2% from £31 768 to £35 654. Over the same period the retail price index rose by just 8%.

The increase marks the second successive three-year period in which the pay of chartered engineers has outstripped the rise in the cost of living.

Both incorporated engineers and engineering technicians have also enjoyed an increase in their real incomes. In 1992 their combined average earnings were £23 483. Now they are £25 725, an increase of 9.5%.

These are some of the key findings of the 1995 Survey of Professional Engineers and Technicians published in October by the Council. The survey, which provides a comprehensive overview of the current working conditions and attitudes of professional engineers and technicians, also contains strong evidence that several other aspects of the profession can be seen as positive and forward looking.

Almost two thirds of the survey respondents are graduates. Nearly a quarter of them occupy management positions, including just over 5% who describe their work as chairman, chief executive or managing director. Engineers at all levels enjoy a marked degree of professional autonomy, with over 88% saying that their work is subject at most to occasional review.

A further indication of the extent to which today's engineers can shape their own working lives is that a quarter of them have an action plan for career development.

Engineers also have a strong perception of the international scope of their profession. Over 67% of them recognise that the European Union will affect their work, including 14% who say it will do so significantly. In consequence over half of all respondents believe that it would be either essential or useful for them to attain European Engineer (Eur Ing) status.

General job satisfaction is evident in the fact that over 67% of respondents would recommend engineering as a career to a young man, while over 60% would do so for a young woman.

Engineering is a secure profession. At the time of the survey, when unemployment nationally was running at 8.3%, only 2.3% of respondents were unemployed.



November 1995

Failure analysis and accident investigation of power plant and distribution networks

One-day seminar, 28 November, Capenhurst, Chester. Details from Ms Del Bennett, Course Administrator, E A Technology, Capenhurst, Chester CH1 6ES. Tel: 0151 347 2557; fax: 0151 347 2178.

Nuclear Decom'95: the strategic, practical and environmental considerations

International conference, 29-30 November, London. Details from Conference & Events Department C504, IMechE, 1 Birdcage Walk, London SW1H 9JJ, tel: Philip George, 0171 973 1316; fax: 0171 222 9881.

1995 Blackett Memorial Lecture: Prof S C Littlechild 'Operational research and regulation: theory and practice'

Lecture, 30 November, London. Details from Seymour House, 12 Edward Street, Birmingham B1 2RX. Tel: 0121 233 9300; fax: 0121 233 0321.

December 1995

The Water Industry: the slings and arrows?

Annual conference, 1 December, London. Details from Delores Broni, The Economist Conferences, 15 Regent Street, London SW1Y 4LR. Tel: 0171 830 1076; fax: 0171 409 3296 or 0171 931 0228.

The two-shifting of CCGT and Fossil-Fired Steam Plant

One-day seminar, 4 December, London. Details from Fiona Bangs, IMechE, 1 Birdcage Walk, London SW1H 9JJ. Tel: 0171 873 1312.

China Resources Recycling '95

Equipment and techniques exhibition, 4-8 December, Beijing.

Details from Ms Iris Tse, tel: (852) 2865 2633; fax: (852) 2866 1770 or (852) 2865 5513.

Exterior lighting design practice

One-day seminar, 6 December, London. Details from Alison Murphy, Mid Career College, P O Box 20, Cambridge CB1 5DG. Tel: 01223 880016; fax: 01223 881604.

Electricity distribution review and regulatory developments

Conference, 6 December, London. Details from IIR Ltd, 29 Bressenden Place, London SW1E 5DR. Tel: 0171 915 5055; fax: 0171 915 5056.

Practical Viscometry Course

Short course, 6-7 December, Harwell, Oxfordshire. Details from Dr Neil Alderman, AEA Technology, Harwell, Didcot, Oxfordshire OX11 0RA. Tel: 01235 435677; fax: 01235 432548.

Diversification & integration strategies

Conference, 7-8 December, London. Details from IIR Ltd, 29 Bressenden Place, London SW1E 5DR. Tel: 0171 915 5055; fax: 0171 915 5056.

Calculations for exterior lighting design — lighting basics 4

Short course, 11 December, Manchester. Details from Mid Career College, PO Box 20, Cambridge CB1 5DG. Tel: 01223 880016; fax: 01223 881604.

Competition in the UK Gas Industry

Conference, 11-12 December, London. Details from Juliane Jung, AIC Conferences, 2nd floor, 100 Hatton Garden, London EC1N 8NX. Tel: 0171 827 5967; fax: 0171 242 1508.

Exterior lighting design practice

Short course, 12 December, Manchester. Details from Mid

Career College, PO Box 20, Cambridge CB1 5DG. Tel: 01223 880016; fax: 01223 881604.

Subsea '95

International conference, 12-13 December, London. Details from Themedia Ltd, PO Box 2, Chipping Norton, Oxon OX7 5QX. Tel: 01608 684700/684888 fax: 01608 684796.

Offshore structures — hazards, safety and engineering: working in the New Era

4th international conference, 12-13 December, London. Details from Janine Stook, Conference Organiser, ERA Technology Ltd, Cleeve Road, Leatherhead, Surrey KT22 7SA. Tel: 01372 367029; fax: 001372 377927.

Wheatstone Measurement Lecture on: The role of the Standards Laboratory in Industry: the vital link in

the UK National Measurement System!

Lecture, presented by Douglas Skinner MBE, and dinner, 13 December, London. Details from Mrs Rose Pride, SET Division, Savoy Place, London WC2R 0BL.

Awareness of measurement related quality issues

Discussion meeting, 13 December, London. Details from Colloquium Office, tel: 0171 240 1871 ext 2205 / 2206.

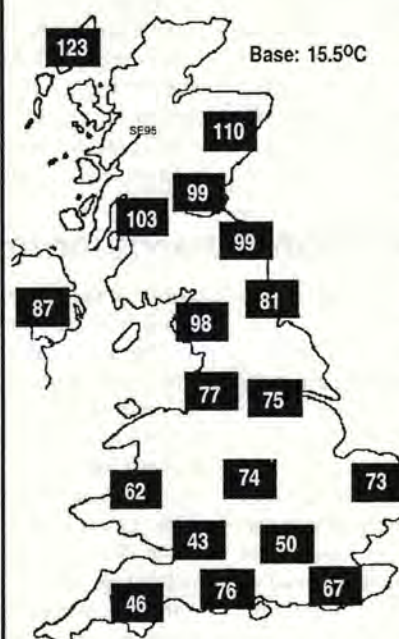
January 1996

Middle East Electricity 96

Exhibition, 14-17 January, Dubai. Details from IIR Exhibitions, Market Towers, 1 Nine Elms Lane, London SW8 5NQ. Tel: 0171 344 3888; fax: 0171 344 3829.

DEGREE DAYS: SEPTEMBER 1995

Source: Degree days direct



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

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

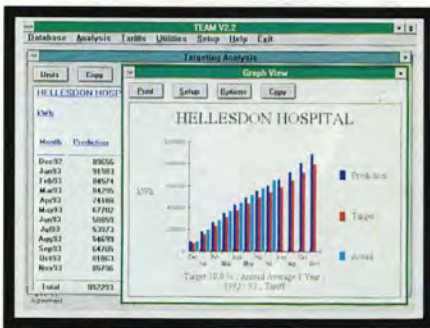
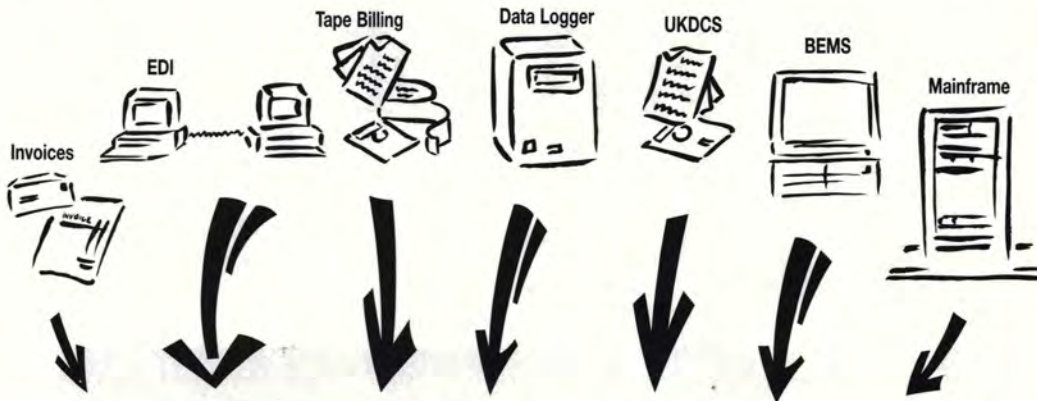
Readers can get more information on the use of degree days from Vilnis Vesma, 17 Church Street, Newent, Glos GL18 1PU (01531 821350)

© Vilnis Vesma, 1995. Note: the figures given here have been calculated to correspond as closely as possible with those published by government sources. However, because of differences in observing stations, close agreement cannot always be guaranteed.

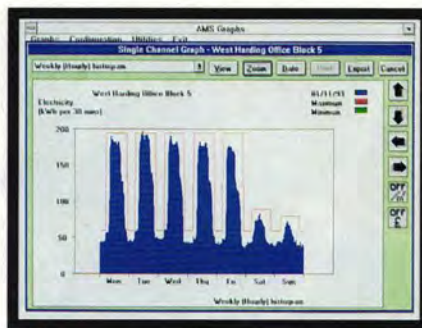
TEAM

software

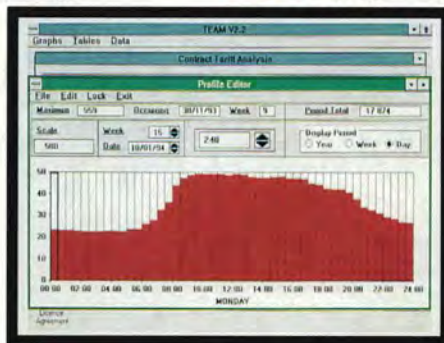
provides ANSWERS not data



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