

despite present difficulties with the Maastricht Treaty.

Before the General Election, the then Secretary of State for Energy, John Wakeham, said there might be a need to look at the overall picture of electricity from gas. After the election, various articles suggested that the President of the Board of Trade was going to take action. At present, however, DTI officials dismiss press comment as speculation. Nevertheless action is needed to shadow and if necessary to guide the market since, at least in the short term, the sums of money at stake are enormous and misallocation could have dire consequences for the economy. There must also be doubt about the ability of the present rudimentary market to deliver the right outcome in environmental terms.

The public access to information which is provided by the Environmental Protection Act will be of great help to those interested in the development of authorisations and subsequent monitoring of compliance with the conditions which are attached to them. The technical expertise which is needed to participate in the authorisation debate and to interpret monitoring data provides a formidable challenge to public interest groups, and it is to be hoped that the regulatory authorities and industry will make every effort to facilitate public understanding. It will be particularly important to place information in context and in this respect it is to be hoped that parties to the organisation of this meeting will be able to produce a readily understandable inventory of local emissions, co-ordinate air quality monitoring, and link them with a consensus on air quality management measures needed to meet air quality standards and targets.

Energy efficiency

So far we have not questioned just how much electric power we will need in future. Can we meet expected demands for services and welfare cost-effectively by using less electricity? The National Grid Company forecast is very much 'business as usual'. It is a central figure with limits of plus or minus 10% and involves a growth of 1.1% per annum. On the basis of history this is reasonable, but there are new pressures which may change the relationship between economic growth and increases in electricity demand.

At present we have a relatively laissez faire regime on energy efficiency, but in other countries the position is different. In many parts of the USA, official consent for new power stations is not forthcoming in many States unless the utilities can demonstrate that efficiency of utilisation is good. Utilities are required to agree on development plans for a five to ten year rolling period with the regulatory authorities, on the basis of wide consultation.

In the UK, we do not have the data to esti-

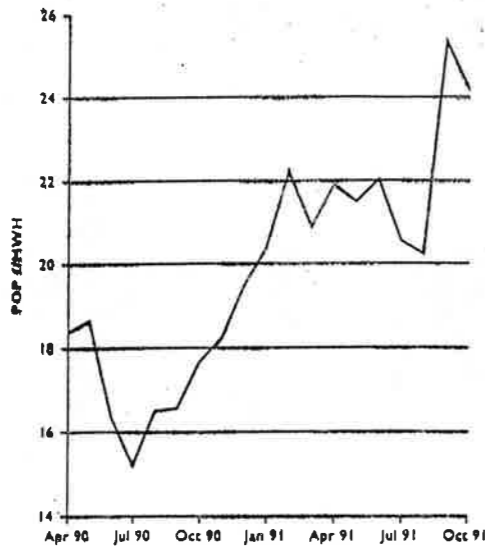


Figure 1: Pool Output Price (POP). Monthly averages April 1990 - October 1991.

mate the scope for improvement with anything like the precision obtained in the USA. Conservative estimates of the scope for cost-effective saving in electricity use whilst providing present levels of service and welfare are of the order of 20%, but the figure may be higher. At present however, efficient use of electricity is low on the national, management and public agenda, so that progress is slow. OFFER, for example, accepts a recent estimate that with present trends it would be more than 200 years before low-energy lighting had penetrated 90% of the domestic market.

Government has established an Energy Saving Trust Fund which will be sustained by a levy on gas and donations from the electricity distribution companies. The sum involved, £6 million, is tiny both in relation to the NFFO and the scale of the problem. We must welcome these moves, but we must debate whether they are sufficient, given the natural tendency of market forces to boost electricity sales rather than efficiency.

So where does the new market for electricity generation put us in relation to the 'S' words of the day: Sustainability and Subsidiarity?

There can be no doubt that at this stage the whiff of gas is a good thing for the environment and the economy. But you will have concluded that I doubt whether the market can get the dose of right unaided. Gas will reduce the environmental impact of electricity generation and give us breathing space to improve the efficiency of electricity use, if we are so minded. It will enable us to weave the thread of electricity generation into the cloth of the economy and society, increasing the proportion of our power which comes

from CHP and renewable resources. However, I believe that the opportunities for by-product electricity will be limited and that we shall need to continue to produce part of our supply from plant dedicated solely to electricity and managed for that purpose. Gas will give us time to develop more environmentally friendly technologies to this end. It may be that full lifecycle analysis will place nuclear power among these options, but more probably I feel that a continuing levy on electricity from gas would be better employed in the improvement of high efficiency, low emission coal-based plant.

Environmental costs

It goes without saying that reduction in demand for electricity reduces the environmental impact as well. In the present market prices do not reflect the full environmental costs of generation. Optimal levels of efficiency in electricity could be achieved in the long run if environmental costs were fully reflected or 'internalised', but we are far short of being able to do this in any sensible way. Meanwhile therefore there will need to be intervention to achieve the levels of efficiency in electricity which are deemed to be in the national interest. Even with full internalisation to achieve the levels of efficiency in electricity which are deemed to be in the national interest. Even with full internalisation of environmental costs an unregulated market would probably deliver the optimal outcome only in the long run, since the general experience is that markets tend to be less effective in resource allocation in the short to medium term. Usually however they tend to out-perform central planning in the long term.

The change which we are witnessing in the East Thames Corridor is a reversal of the trend towards economy of scale and distancing power plant from people. There are benefits in bringing electricity back into the community, but it has to be on the community's terms. I have already made clear that the engineers can provide virtually any environmental performance which is demanded. The EPA provides a framework for consultation on tactics and the Electricity Act provides a framework for control of strategy. It is for the community to seek realistic standards and to accept the full cost of service.

Clearly there is a strong local dimension. We need subsidiarity, the delegation of authority to the most competent level, to achieve a local consensus on air quality management. The consensus will put the environmental impact of industry, including electricity, transport, bonfires, barbecues and the like in appropriate perspective. It will inform priorities and give clear signals to the entrepreneurs who are essential if the market is to work. The consensus will only be valid if it is based on discussion between a very wide

CHP — the way forward

A LARGE proportion of energy generated in this country escapes into the atmosphere in the form of waste heat. It is possible to recover the heat emitted from the turbine or engine which is also generating electricity.

by Ed Wilson*

Combined heat and power (CHP) technology enables waste heat to be drawn off through a heat recovery unit and turned into useful energy, which can then be used for heating, steam and generating additional electricity for on-site usage. Any excess power can be sold to a regional electricity company (REC).

Environmentally, CHP technology substantially reduces the discharge of emissions, such as CO₂, into the atmosphere as the energy produced is used much more efficiently. This in turn can lessen the dependence on volatile oil and electricity prices. In today's economic climate CHP can be viewed as a more efficient and sensible way to utilise energy resources.

CHP schemes vary from small-scale units producing less than one megawatt of electricity to larger-scale schemes capable of generating large amounts of power.

Small-scale CHP can be applied to almost any premises with a consistent heat demand. Hospitals, hotels, leisure centres and residential blocks are currently the main candidates

As one of the leading contract energy management companies in the UK, AHS Emstar has provided energy management services for clients as diverse as South East London Combined Heat and Power (SELCHP) and London Zoo. In the following article Ed Wilson looks at the role of CHP in energy management projects, illustrated with several of AHS Emstar's recent contracts.

for such schemes. As electricity costs and consumption increases in buildings, and plant reliability continues to improve, small-scale CHP units have become more common.

The Rotherhithe Leisure Centre is a small-scale CHP scheme run by AHS Emstar on behalf of the local authority. The scheme has cut down operating costs by generating 50% of its own electricity and, in addition, redistributes heat recovered during the process into the heating and hot water system. The scheme is remotely controlled by computer allowing the local authority and AHS Emstar to closely control and optimise energy usage at the Rotherhithe centre itself and indeed from AHS Emstar's own control centre.

Building large-scale CHP plant is a much more complex exercise. The schemes are

highly capital intensive and usually require the expertise of a specialist organisation which can provide the design and engineering required by projects of this scale. Only a few companies, like AHS Emstar, have these skills. In addition, AHS Emstar can offer the capital finance needed for such schemes. CHP is a cost-effective system for many applications and typically achieves simple pay-back on investment of between three to five years.

Tunnel Refineries, part of the Tate & Lyle Group, recently signed a CHP contract with AHS Emstar worth nearly £10 million for their Greenwich refinery. The ten year contract, involving capital investment by AHS Emstar of some £8 million, is the largest of its kind to be engineered, funded and operated by a contract energy management company. As a result Tunnel Refineries have gained a net £500 000 saving on their annual energy bill.

CHP can also be applied very effectively to waste incineration schemes. AHS Emstar have been operating the UK's first waste-to-energy scheme since it was built in 1973, in Nottingham. It is the only city-wide CHP scheme in the country, burning over 480 tonnes of municipal waste a day. It serves domestic properties, commercial developments and public sector buildings, as well as supplying low-pressure steam to local industry. Surplus electrical power produced is sold to the regional electricity company.

The latest waste-to-energy scheme in which AHS Emstar is involved is SELCHP (South East London Combined Heat & Power). It will be the first scheme of its size to be built for nearly 20 years. The plant is

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He spent five years with Foster Wheeler Energy Ltd, of which two years were spent in South Africa working on major power station and refinery projects.

More recently he was Business Development Manager for Courtauld's Engineering with responsibility for Combined Heat & Power amongst other marketing responsibilities. For two years he was Chairman of the Combined Heat & Power Association's Industrial Forum.

Subsequently he was appointed Marketing Director of AHS Emstar plc, the leading UK company in Contract Energy Management, maintenance and related energy services.

* Marketing Director, AHS Emstar



scheduled to open for business at the beginning of 1994. With a total capacity of 400 000 tonnes per year, the plant will burn all the municipal refuse collected by the two London Boroughs — Lewisham and Greenwich. The scheme will sell its 31 MW of electrical output to London Electricity under the Government's Non-Fossil Fuel Obligation (NFFO). It will also be capable of producing heat, in the form of hot water, for district heating of local housing and other buildings.

Northumbrian Water, one of the ten regional water companies in England and Wales, wanted to optimise the efficiency of energy production at seven of their treatment plant. To achieve this, methane gas, a by-product of the process, is used instead of Natural Gas to drive CHP units for the production of hot water and electricity.

AHS Emstar were asked to maximise the efficiency of the energy plant. This involved design, commissioning and installation of new equipment where required and refurbishment of old plant to optimise electrical output; installation of a fully computerised energy management system (EMS) to continuously monitor gas intakes and electricity generated; a planned maintenance schedule to cover all aspects during the contract period, and management of surplus electricity produced by the CHP units.

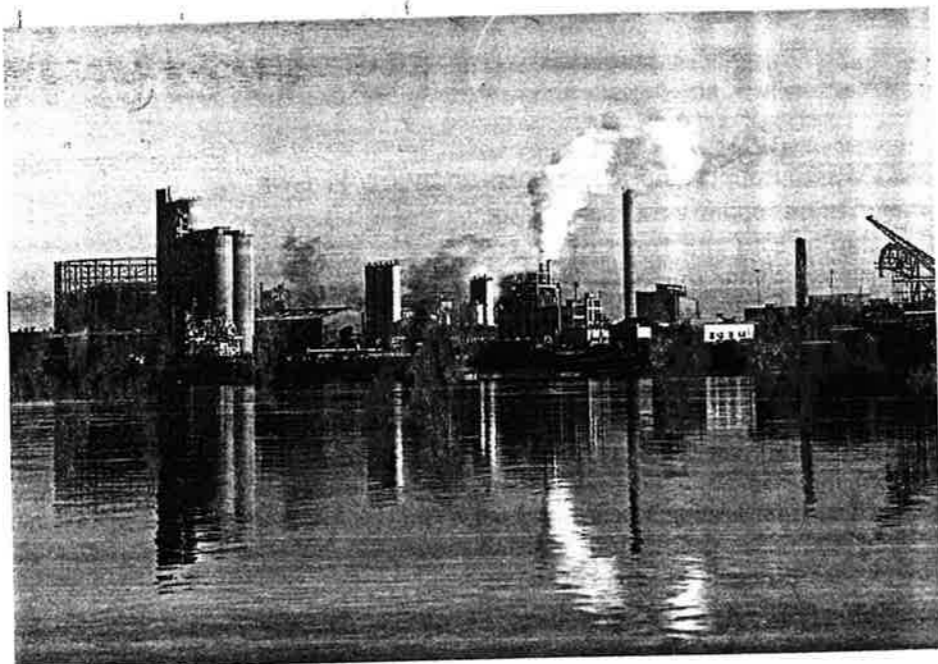
Each site was assessed and an engine chosen either from existing or new stock and installed to match gas output. Existing engines underwent a complete overhaul.

Having matched the engines to the sites AHS Emstar were able to guarantee the client an 85% utilisation factor and therefore produce 7446 hours of output. In order to maintain this utilisation factor, each site is fitted with a Trend IQ 151 management unit and all engine condition parameters are constantly monitored and transferred back to the AHS Emstar offices for analysis.

Each month gas and oil samples are taken and analysed for calorific value H₂S levels, moisture content and other contaminants.

The long-term nature of the partnership between AHS Emstar and Northumbrian Water was confirmed with the signing of a 20 year contract. The turnkey service is designed to maximise recovery of the methane by computerised control systems. This in turn increases the effectiveness of the CHP units to produce a greater output of useful energy. Indeed, AHS Emstar are also responsible for selling surplus electrical output to Northern Electricity at competitive prices.

All plant is regularly serviced to ensure maximum efficiency. Under a planned maintenance schedule, AHS Emstar engineers oversee the energy plant 24 hours a day via remote monitoring and alarm systems installed at each site. Information is gathered continuously on gas intakes and electricity



The Tunnel Refineries site at Greenwich. AHS Emstar financed, engineered and now operate and maintain the 15 MW CHP scheme.

generated in order that a full overview of all sites is available at all times.

In March this year a new £13 million energy plant was commissioned at Aberdeenshire papermakers, Thomas Tait & Sons.

The 22 MW combined cycle CHP scheme, the largest in the UK papermaking industry, will cut energy costs by 30% at Tait Paper's Inverurie mill and yield a sizeable reduction in emissions of NO_x, SO₂ and CO₂. Of particular importance to the mill's operation, it will also turn the papermakers from being major consumers of electricity to being producers and net exporters, selling to Scottish Hydro Electric.

The new plant was designed and installed by AHS Emstar through its Newark-based power consultancy division. The specialist team handled the initial feasibility study and plant design, and carried full responsibility for project management, commissioning and plant handover, under contract to Tait Paer.

The scheme is part of a £45 million programme to significantly increase papermaking production, with a corresponding increase in demand for electricity and process steam.

To meet power requirements at the mill, which currently manufactures 125 000 tonnes of commercial printing and copying paper a year, electricity had previously been bought from the regional board. The considerable volume of heat required in the paper drying process was raised by a stand alone steam boiler plant fuelled by gas and coal. The new plant will initially produce 22 MW of power, rising to over 30 MW in a second phase of the programme in 1995. Two 'Tornado' gas turbines are used to generate 12.5 MW of electricity. Exhaust heat from the generators is recovered and piped to two

supplementary-fired Senior Thermal waste-heat steam boilers, which together raise the steam required in the paper drying process. The gas turbines and boilers can run on either natural gas or gas oil, and supply can be changed over instantaneously. There is also a provision to burn heavy fuel oil in the boilers.

High pressure steam from the boilers is sent to an NEI Allen steam turbine, which generate a further 10 MW of electricity.

Central to the operation is a sophisticated digital control and monitoring system, which provides information on the plant's status, calculates the optimum plant operating conditions and controls the main items of equipment.

The Government's relaxation of the Treasury Rules on public sector borrowing has meant that this sector is opening up to independent consultants. They are well positioned to help the government estate to reach its target of reducing energy bills by 15% by the end of the century; as set out in the White Paper on the Environment. For example, NHS hospitals can benefit greatly from CHP technology which can be harnessed to clinical waste incineration schemes.

The recognition of CHP's potential is growing. It is already a proven technology, having been around, in various forms, for nearly a century. Although initial capital outlay can be high, contract energy management consultants can provide the capital finance. Payback can be accomplished in a relatively short period of time. The benefits that CHP technology can bring to the environment by substantially lowering the emissions of noxious gases and the considerable economic advantages that can be achieved, cannot be ignored.

Environmental legislation

— a real opportunity for energy intensive businesses

by Tony Phillips*

THE CURRENT recession is not seen as the ideal time to invest in new plant. However, the timetable for compliance with the Environmental Protection Act (EPA) 1990 is already in operation. This means that managers in most energy intensive industries must invest to meet the required standards, no matter how severe the business climate is becoming. This may involve some businesses in metalworking, glass, rubber and ceramics, building in costly investment programmes at a time when businesses are least able to support them.

While many managers must view this situation with great concern, it does represent a great opportunity; the opportunity to invest in new 'clean' processes which also enhance quality, improve energy efficiency and reduce operating costs. In many cases the best 'clean' technology offers other advantages which far outweigh the actual cost of compliance with the EPA.

In the last year Midlands Electricity have investigated the opportunities offered by the recent environment legislation. This has led to the production of a series of guides covering ferrous and non-ferrous metal melting, metal heating and heat treatment, and the manufacture and processing of ceramics, rubber and glass. These guides review the legislation and suggest possible applications of electrical technology which assist businesses to comply with the rules and regulations associated with the 1990 Act.

There is no doubt that the legislation is spurring development of suitable 'clean-up' technologies, but by far the best solution is to minimise or eliminate the real source of the emissions or pollutants. If these emissions can be removed or reduced, and quality or productivity improved, this makes the investment not only necessary but desirable. This is especially true when it comes to quality.

In the following article, Tony Philips gives advice on how to comply with new environmental legislation, and indeed how companies can benefit from new measures necessary to comply with energy law.

Recently there has been great emphasis on quality. European and national standards such as ISO 9000 and BS 5750 are becoming a precondition for businesses in many engineering sectors, while manufacturers such as Ford, are setting their own special standards. This is also happening in the environmental area with the increase in interest in the new Environmental Quality Standard BS 7750.

Like BS 5750, it seems likely that many customers (both 'end' and intermediary) will demand this standard to be met in products supplied to them in the future.

The metalworking industries have been affected to a considerable degree and there is no doubt that the combustion of environmental legislation and more demanding quality standards has changed attitudes to capital investment and choice of energy source.

In this context one concept introduced by the new legislation, BATNEEC — the Best Available Technique Not Entailing Excessive Cost — is particularly relevant. The use of electric metal melting techniques can improve quality and, at the same time, virtually eliminate undesirable emissions.

The cost of meeting new air pollution standards are high for fossil fuel-fired systems. The chief problem is the handling, filtration and treatment of massive volumes of air. If new chimneys have to be constructed, for example, the costs can exceed £3000 for each metre. Cupola metal melters in particular have severe problems. Cupola melting produces SO₂, free carbon, miscellaneous smoke fumes and some other undesirable pollutants such as phosphorus.

Even if the costs of equipment are incurred to comply with current legislation, to avoid the risks of prosecution and unlimited fines, this does not protect the polluter against changing legislation. Investment in 'clean-up' technology alone does not protect the business against legislative changes in the future. The flavour of 'cleaner from source up' will continue to be reflected in future EC Directives. So, a complete re-think of product and process is desirable if investment is to meet the needs of future rules and the EPA and be profitable.

Electric production technologies, such as induction or resistance melting of metals, resistance heating for glass, and microwave

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As a member of Midland Electricity's marketing team, Tony has helped develop strategies which take into account the changes brought about by privatisation of the ESI.

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