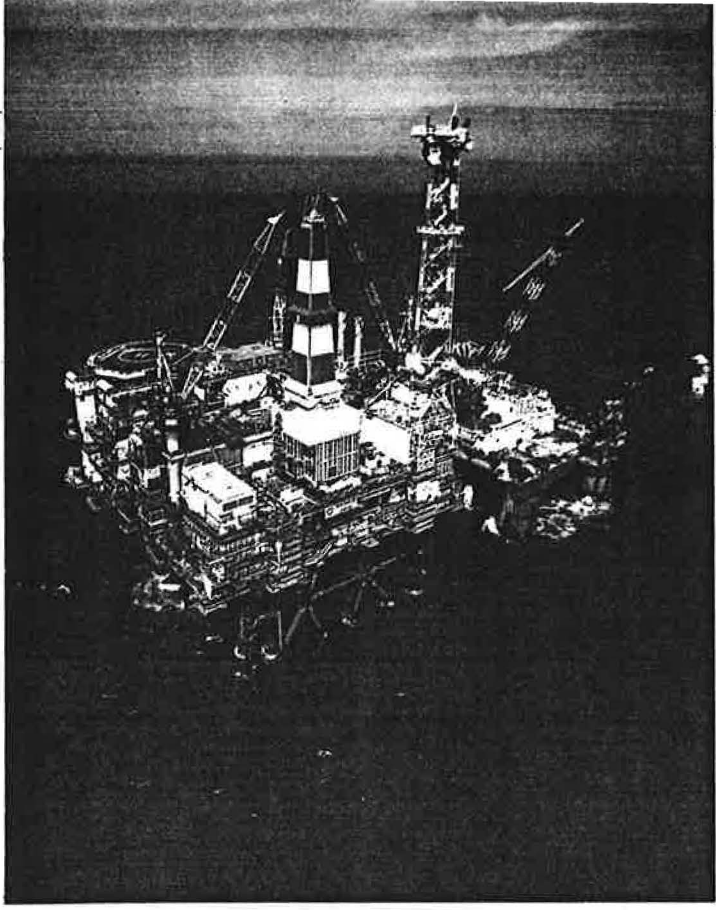
#3988



Production platform in BP's Magnus oilfield north-east of Shetland. On stream since 1983, it is the largest, deepest, most northerly and one of the largest producers of oil and gas.

ENERGY: the burning question

Approximately £38 billion was spent on energy in the UK last year. Of that huge total, £11 billion was spent in the domestic sector, over £6 billion in industry and nearly £5 billion in the commercial and public sectors. The remaining £16 billion went on transport.

For the construction industry, the selection of energy source is often dictated by circumstances but savings can be made both in cash terms and in consumption.

Figures from the Department of Energy highlight the fact that, nationally, a massive percentage of the country's GDP goes on satisfying the insatiable need for energy.

Rising costs, alternative sources, new technology, new regulations and 'pressure' are all contributing to making the industry take stock of its activities and apply serious consideration to future requirements and availability.

Currently, **Industry** accounts for 28 per cent of all fuel used (**Table 1**). This breaks down into percentages on a 'heat supplied' basis as follows: solid fuel 24, petroleum 24, gas 34, electricity 18 (**Table 2**). On an 'expenditure' basis, this converts to: solid fuels 16%, petroleum 13%, gas 20%, and electricity 50% (**Table 3**).

A relatively crude interpretation of these figures is that petroleum is currently the cheapest option available, simply because the world is enjoying perhaps the lowest oil prices, in real terms, it has ever experienced.

Table 1: Percentage of each fuel supplied to industry

All fuels	28%
Solid fuels	59%
Petroleum	16%
Gas	30%
Electricity	34%

How long this will continue must be a matter of conjecture. Whilst there is nothing on the immediate horizon to suggest that there will be any significant change in this position, it has to be recognised that it has proved vulnerable to outside influences in the past and could do so again in the future. As shown in **Table 4**, petroleum reached a peak in usage in the early '70s, before the 'oil crisis' forced industry to look at safer alternatives.

Gas shows up as the next best option, followed by solid fuel, with electricity lagging a long way behind.

Table 5 shows the steady increase in the energy consumption in construction across the three main elements of gas, electricity and petroleum over the last five years (1984-88). Use of gas has increased during the period by around 45 per cent, electricity by 22 per cent, and petroleum by 10 per cent.

Price

Department of Energy figures highlight the variations in the prices charged for the same fuels in different locations throughout the country, showing a surprising disparity. **Table 6** shows that it is better to operate in Leeds than in London if using solid fuel (+22 per cent), if using gas it is better to operate in Birmingham or Nottingham than Cardiff or Plymouth (+4 per cent), and those using electricity would be better off in Aberdeen than in Liverpool (+14 per cent).

For the contractor or developer, it is advisable to examine the available options in detail because significant 'deals' can be made with local suppliers who are open to a certain amount of negotiation particularly where long term contracts can be concluded.

Table 2:
Share of fuel to industry – heat supplied basis

Solid fuels	24%
Petroleum	24%
Gas	34%
Electricity	18%

Table 3:
Share of fuel to industry – expenditure basis

Solid fuels	16%
Petroleum	13%
Gas	20%
Electricity	39%

Energy efficiency

Energy efficiency is the 'in' phrase at the moment and is gaining increasing importance, particularly as a result of pressure from the 'green' factions.

The insistence upon better insulation, with new thermal standards being introduced in April next year (**Table 7**), had been signalled for some time and many designers have succeeded in meeting and exceeding the required standards well in advance.

More effort is being concentrated on finding and implementing methods to combat the effects of cold and damp in older buildings successfully.

Lighting, which accounts for an astonishing 15 per cent of electricity consumption in the UK, is also under scrutiny. Well in excess of £1,200 million is spent on energy for lighting and it is estimated that this could be reduced by over 20 per cent (£250 million) by employing energy efficient methods such as converting to high pressure sodium lamps with their lower installation, maintenance and operating costs.

Energy audit

As energy audit should be a fundamental part of any energy management programme that an organisation might carry out with a view to controlling its energy costs. Properly conducted, it will identify areas where waste can occur and where there is scope for improvement. A ten per cent saving on the national energy budget would save the country £3,800 million each year. A similar saving in individual organisations must surely be equally welcome, facilitating improvements to services – internal and external, increased profits and, where applicable, a more competitive pricing policy.

Companies cannot afford to be complacent about their energy costs. They are relatively fluid over a period of years and can be monitored to take advantage of changes in price structures.

Degree days

Part of the equation in determining heating and lighting requirements is the determination of what are known as degree days: these are the measure of the variation of outside temperature to enable building designers and users to determine how the energy consumption of a building is related to, and affected by weather.

Degree day calculations are recognized as being extremely important in monitoring the benefits of energy saving measures particularly as it can be seen that very large amounts of energy can be saved.

What are they?

When a temperature inside a building is higher than that outside, heat loss will occur – by conduction or by the introduction of cold air – and the rate of heat loss is directly proportional to the temperature difference between inside and outside. This difference is rarely constant.

Degree days can be heating or cooling degree days.

The method of calculation of degree days is considered too complicated to cover in this article and further reading is recommended.*

Additional factors affecting calculations are wind pressure, particularly in built up areas and/or with tall buildings (as wind pressure increases the ventilator rate rises). Where there might normally be around three air changes per hour,

Table 4:
Consumption of primary fuels and equivalent for energy use

	1960	1970	1980	1988
Coal	198.6 (73.7%)	156.9 (46.6%)	120.8 (36.7%)	112.0 (32.9%)
Petroleum	40.1 (25.3%)	88.2 (44.6%)	71.4 (37.0%)	68.3 (34.1%)
Natural gas	28.0 (–)	4486.0 (5.3%)	17779.0 (21.6%)	20378.0 (24.0%)
Nuclear electricity	21754.0 (0.4%)	22805.0 (2.8%)	32291.0 (4.1%)	55642.0 (6.7%)
Hydro electricity	3117.0 (0.6%)	4524.0 (0.7%)	3921.0 (0.6%)	4631.0 (0.7%)
Imported electricity	–	–	–	12830.0 (1.5%)

Table 5:
Energy consumption in construction

	84	85	86	87	88
Natural gas (M.therms)	17	21	24	25	26
Electricity (GWh)	875	955	970	1005	1065
Petroleum (Th. tonnes)	870	899	890	930	956

* *Fuel efficiency booklet No. 7: Degree Days: CIBSE Guide 1987; Estimating monthly degree days; Degree days in Britain.*

Table 6:
Typical retail prices of domestic fuels: 1988

Town	Solid fuel – per 50k (average across types)	Gas – per therm (average)	Electricity – per kWh (average)
Aberdeen	746	52.5	4.63
Birmingham	714	50.4	5.0
Cardiff	747	52.45	5.18
Liverpool	696	51.2	5.27
Leeds	664	51.2	5.04
London	810	52.45	5.08
Manchester	699	51.2	4.95
Nottingham	679	50.4	4.88
Plymouth	809	52.45	5.24

Table 7
Changes to U-values in new regulations

Description	Revised U-value under new building regulations (W/m^2K)	Old U-value under 1985 building regulations (W/m^2K)
Walls – domestic	0.45	0.6
– non-industrial	0.45	0.6
– industrial	0.45	0.7
Roofs – domestic	0.25	0.35
– non-industrial	0.45	0.6
– industrial	0.45	0.7
Ground floors – domestic	0.45	none
– non-industrial	0.45	none
– industrial	0.45	none
Floor exposed to external air	0.45	0.6
Semi-exposed walls and roofs	0.6	none

wind pressure increases can raise this up to 25 changes (recorded in the top floor of a 10-storey building).

Solar gain will also affect the degree day calculation where heat inputs – through captured sunlight in buildings with a high glazed area and low fabric loss – are large compared to the rate of heat loss.

Geographical location and orientation of a building are also to be taken into contention.

Outside help

There is at least one organisation whose sole aim is to work on clients' behalf to minimise their expenditure with utility suppliers.

NUS (National Utility Services) is a worldwide organisation that gathers comprehensive information on actual prices paid by many thousands of business users of electricity, gas, oil, petroleum, water, and Telecommunications.

The company is able to analyse the utility needs of the client and determine from their available data the rate of charges that should be levied. Any differences will then be examined by the NUS organisation, who will advise and brief the client company so that the case can be pursued with the supplier.