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**ENERGY POLICY ISSUES
AFTER PRIVATISATION**

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Energy Policy Issues After Privatisation*

ABSTRACT

The purpose of this paper is to investigate how energy policy should respond to the changes in the organisation of energy sector associated with privatisation. The paper begins with a brief review of how energy policy was perceived before the 1973 oil shock, and the lessons learned from subsequent experience, both in terms of the issues which were thought to be important, and the theories which were argued to be relevant to its design. This brings us to the present, and the need to rethink energy policy in the light of experience and the changes in market structure. The four questions raised by these changes are: what should be the Government's policy on competition in the energy sector, how the privatised industries should be regulated; how the remaining publicly owned industries should be instructed to behave, and finally, what changes in taxation are now desirable.

JEL classification: 610, 613, 723

Keywords: energy policy, privatisation, regulation, taxation, gas, coal, electricity, oil

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NON-TECHNICAL SUMMARY

Before 1973 all indigenous fuel was supplied by nationalised industries and the need for energy policy was seen as equivalent to the need for a policy for these nationalised industries. The present Government has expressed the view that nationalised industries should, where possible, be transferred to private ownership, and is taking steps to achieve this for some of the fuel industries. The purpose of this paper is to investigate how energy policy should respond to these proposed changes in the organisation of the energy sector.

In the 1970's, economists were reasonably confident of the principles which should underlie an energy policy. The three main issues to address were how energy prices should be set, how investment decisions were to be made, and how to ensure the efficient management of the industries. Welfare economics gave reasonably clear answers to the first two questions, but was silent on the third. The question of whether the industries should remain in public ownership was not seriously considered. Economic theory argued that production and investment decisions in the public sector should aim at efficiency. Distributional objectives should be addressed by the tax system as a whole, and not by adjusting the prices of public sector outputs alone. These redistributive objectives could be met by the system of direct taxes and transfers alone, with Value Added Taxes set at a uniform level.

The practical implications of this theory can be quickly summarised. The main market failures relevant to domestic energy policy are, in order of importance and difficulty: the existence of natural monopoly in electricity and gas distribution; labour market failures in the coal industry; the absence of futures and insurance markets; and problems of environmental pollution. Economic theory argues that these market failures should be

addressed directly, in this case by ensuring that the prices of energy are correctly set. Specifically, the producer prices of energy should be set at the marginal social cost of production or the opportunity cost (the world price for traded fuels such as oil and coal, and the marginal extraction cost plus rent for gas). Investment decisions are then evaluated using a Test Discount Rate (TDR).

These principles were largely incorporated into the 1967 White Paper with the possible exception of the principles for setting commodity taxes. They have not changed significantly since the early 1970's, though the Government has shown increasing disenchantment with them. The reason is simple - they do nothing to ensure that the industries are managed efficiently. The growing evidence that deregulation and increased competition could dramatically lower costs in some industries has changed the nature of the debate on the best way to control the energy industries. The Government has therefore privatised the oil industry and intends to privatise British Gas in the autumn of 1986.

How should we now view energy policy given recent experience and changes in market structure? The four questions raised by these changes are: what should be competition policy in the energy sector?; how should the privatised industries be regulated?; how should the remaining publicly owned industries behave?; and finally, what changes in taxation are now desirable?

As far as promoting competition is concerned, the decision to privatise the British Gas Corporation (BGC) as a single monopoly represents a lost opportunity. There is still time to improve the prospects for competition, however, by building pipeline links to the Continent and ensuring free and fair access to the pipeline system. The Central Electricity Generating Board (CEGB) should

be allowed to burn gas for power generation. Provided the CEGB is required to earn a reasonable rate of return, the requirement that it should purchase electricity from private suppliers at the Bulk Supply Tariff rate should permit efficient competition from private suppliers. In the case of coal, allowing private operators to develop new pits, and coal buyers freedom to import, would put appropriate competitive pressure on British Coal.

The price-based system of regulation for British Gas has desirable incentive properties, though the Corporation's ability to pass on the average cost of gas purchases may have some undesirable consequences. Predatory pricing within the regulated sector can be minimised by publishing forecasts of likely future gas prices. There may well be advantages in extending this system of price regulation to the CEGB.

The final question concerns desirable changes in taxation. Two key reforms are long overdue in the energy sector. First, the taxation of rent is unsatisfactory (outside the oil industry). The main reform needed is to ensure that the rents accruing to the BGC and its customers on old, low-priced contracts are appropriately taxed, perhaps by a modified Gas Levy.

Alternatively, the Treasury could auction the rights to the existing contracts to oil companies, who would then be free to renegotiate new contracts with a privatised British Gas. There is also the anomaly that British Coal collects the royalties on privately operated coal mines - primarily the open cast pits. Logically the Treasury should set and collect such taxes, which should be rent taxes rather than royalties.

Second, the taxation of energy consumption is a mess. At the moment some intermediate goods (heavy fuel oil) are subject to an excise tax when they should be subject only to VAT, whilst other final consumption goods, notably gas and electricity, are zero-

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rated for VAT. The fuel excise duty should be abolished, and VAT at the standard rate should be imposed, with compensating adjustments to supplementary benefits and the level of tax thresholds to offset any adverse distributional impacts. The only exception to the rule of exempting fuels from excise duty applies to motor fuel, where the excise duty is properly seen as a road user charge.

ENERGY POLICY ISSUES AFTER PRIVATISATION

Before 1973 all indigenous fuel was supplied by nationalised industries and the need for energy policy was seen as equivalent to the need for a policy for these nationalised industries. The present Government has expressed the view that nationalised industries should, where possible, be transferred to private ownership, and is taking steps to achieve this for some of the fuel industries. The Government has on occasion given the impression that this change of structure, from one of Government control to one of market responsiveness, means that there is no longer any need for an energy policy as such. The purpose of this paper is to investigate how energy policy should respond to the profound changes in the organisation of the energy sector.

I shall begin with a brief review of the how energy policy was perceived before the 1973 oil shock, and the lessons learned from subsequent experience, both in terms of the issues which were thought to be important, and the theories which were argued to be relevant to its design. The period from 1973 to 1983 was a testing one for energy policy, but recent events in the oil market suggest that the future may be almost as unpredictable now as it was in 1972 (though we may now be more aware of the inherent uncertainties.) How well did past energy policy fare in the face of unexpected shocks, and how well equipped is current policy to deal with similar shocks? This brings us to the present, and the need to rethink energy policy in the light of experience and given the changes in market structure. The four questions raised by these changes are: what should be the Government's policy on competition in the energy sector; how the privatised industries should be regulated; how the remaining publicly owned industries should be instructed to behave; and finally, what changes in taxation are now desirable.

Economic policy consists of choosing whether and how to intervene in the economy to improve its performance measured by certain criteria. Energy policy is that part of economic policy that affects the production, supply and use of energy. It follows that energy policy cannot be considered independently of economic policy, in particular the structure

of taxation. The Government has at various times implied that energy policy (as opposed to the lack of policy) involves the Government taking action to alter the pattern of production and consumption away from the pattern that would arise from the free working of market forces. Indeed, the present Government has sometimes claimed that there is no need for energy policy as such, meaning that decisions can be left to market forces. For present purposes I shall consider the 'market forces' option as one particular form that energy policy might take, for it still leaves open the important question of the choice of taxes which will modify these market forces.

Energy policy in 1972

It is interesting to go back and see how energy policy was perceived before the dramatic oil price rise of 1973. In addition to the White Paper of 1967 - *Nationalised Industries: A Review of Economic and Financial Objectives* (Cmnd 3437), and various reports of the House of Commons Select Committee, Michael Posner has provided just such an account in his *Fuel Policy* (Posner, 1973). Interpreting these various sources rather freely one could argue that the main purpose of energy policy was seen as guiding and coordinating the investment decisions of the nationalised fuel industries (coal, gas, nuclear power and electricity). The second aim was to design a price and tax structure for all fuels which would induce consumers to make efficient choices whilst at the same time meeting the Government's revenue objectives. The case for an active energy policy (as opposed to leaving decisions to market forces) had two strands. First, it was felt that the coal industry in particular suffered from significant market failures, whilst inflation, incomes policies, and overvalued exchange rates further distorted market signals. Second, several of the industries were highly interdependent, and explicit coordination was felt to be needed. The size of the coal industry would depend on the demand for coal from the CEGB, and this in turn would depend on its use of oil, gas and nuclear power. Given the long lead times involved in ordering power stations and in adjusting employment and output levels in the coal industry, as well as the market failures already alluded to, and the considerable uncertainties on prices, costs, supplies and construction times, this desire to improve coordination is

understandable.

Given these aims, energy policy was then argued to be fairly straightforward in principle. The first part consisted in estimating the marginal cost of supply of the different fuels, correcting for the various market failures, for a sequence of dates in the future. The second step was to recommend setting prices at long run marginal cost (which would equal to some average of the estimated marginal supply costs over an appropriate time horizon) so that consumers, in making their investment decisions, would be led to choose the least cost pattern of energy use. The final step was to estimate the levels of supply and demand at these prices and costs, and hence determine the rate of expansion (or contraction) of the various industries. The end result would be a desired investment plan, and this in turn would focus attention on the problems involved in achieving it. The potentially tricky issue of determining the appropriate long run marginal cost for a depletable resource was sidestepped, for oil was imported, and gas was to be depleted as fast as possible.

Seen from the perspective of the early 1970's, the main issues were fairly clear. Nuclear power appeared to be the least cost method of producing baseload electricity, assuming no significant increase in the real price of oil, though allowing for the price rises of 1970-72. The cost advantage over alternative fuels was not large, but given anticipated technical progress in the nuclear industry, and the likely rises in the marginal cost of indigenous coal, the main constraint was seen as the speed at which additional nuclear power stations could be constructed. This in turn meant that nuclear power was inframarginal and the main competition for fuels in the electricity generating industry was between coal, gas and oil. The low extraction cost of North Sea gas suggested that the best depletion policy was to maximise the rate of extraction and use, which argued for using gas to displace oil and possibly coal in electricity generation. The price of oil was such that it was cheaper than a considerable fraction of British coal production. Consequently the main problem was seen as choosing the rate at which the coal industry should contract. Here the main market failure was that the opportunity cost or shadow wage rate of miners was argued to be significantly below

their market wage, as their alternative employment prospects were poor. Thus energy policy consisted in large part in determining the rate at which oil should substitute for coal, given that oil was imported and the exchange rate was felt to be overvalued, whilst coal was domestically produced at an apparent cost felt to be higher than the true cost. Part of the answer consisted in the hydrocarbon duty, which raised the domestic price of fuel oil and hence made oil less attractive, part consisted in allowing the coal industry to run effectively at a (marginal) loss, by setting prices at average cost (well below marginal cost), and part consisted in preventing or discouraging the use of gas in power generation.

Table 1 reproduces the forecast figures for '1980' made by Posner towards the end of 1972, based on the assumption that the UK would supply energy at least cost by '1980', given the constraints on the rate of expansion of gas, nuclear power, and given the estimated medium run supply curve for British coal and of imported oil. It also gives the outcome for 1980.

Table 1 Forecast of Primary Fuel Use

	M.t.c.e			
	1970 actual (1)	'1980' forecast (2)	1980 actual (3)	ratio act/fcast (3)/(2)
Coal	157	95	121	1.27
Natural gas	18	50	71	1.42
Nuclear and hydro	12	50	15	0.3
'Fuel energy' oil	105	155	67	0.43
Total 'fuel energy'	292	350	274	0.78
Transport petroleum	41	73	54	0.74
Total petroleum	146	228	121	0.53
Total fuel	333	423	328	0.78

Sources: Posner (1973, Table 17.2, p336)
Digest of UK Energy Statistics 1984

Obviously, it was unreasonable to expect growth over the period 1972-1980 to be so low (at 1.7 percent per annum, compared with a figure which was assumed to be almost twice this rate). Nor was the sharp rise in all real

energy prices foreseen, with the consequent reduction in fuel use per unit of GDP. Nevertheless, several features stand out. First, the coal industry failed to contract as fast as considered desirable. Second, natural gas grew much faster than forecast. Both can be attributed to the sharp increase in the price of oil, as can the sharp drop in the 'fuel energy' oil use (ie non-transport use, in which oil competes with other fuels.) The growth in nuclear power is surely deeply unsatisfactory, for although electricity demand stagnated over this period, it was still economic to replace existing high cost plant by cheaper nuclear power. The slow growth in transport fuel use reflects the slow growth in real income as well as increased fuel efficiency.

The experience of post-1973 energy policy

What lessons can be learned with the benefit of hindsight? It was surely right to see the contraction of the coal industry as the main problem, though the dramatic oil price rise initially obscured this fact. But if the value of coal suddenly rose in 1974, so did the prospects for a growth in internationally traded coal, for the following reason. Transport costs for coal are significantly higher than for oil, and when oil was cheap, it was relatively unprofitable to export coal. When the price of oil rose, so did the demand price for coal delivered to Western European ports. The export value of coal in Australia, the East coast of the U.S. and South Africa, which was equal to the delivered price in Europe less transport costs, rose above the cost of mining it and delivering it to the port and coal exports suddenly looked very attractive. It was reasonably clear that a significant fraction of British coal would be uncompetitive with foreign coal, even if coal became competitive with oil and gas. One of the factors which certainly did not help was the practice of pricing coal at average rather than marginal cost, so that the need to close marginal pits was obscured. The nuclear power issue was mishandled, certainly compared with the French programme. No doubt the CEBG lacked the singlemindedness needed to push through an effective programme as they were under pressure to take more coal than they wanted when the demand growth for electricity had disappeared.

The unforeseen rise in world oil prices and the subsequent

exploitation of North Sea oil presented additional challenges to economic and energy policy. The main problem perceived by the Government was to ensure that the country benefitted from the oil wealth whilst consumers were encouraged to economise in the use of all, suddenly more valuable, fuels. In this we were probably lucky that oil became available only after the price rise, for it was then abundantly clear that a new system of rent taxation was urgently needed to retain the oil wealth for the national benefit (rather than for the benefit of the oil companies) and also to avoid inefficiently rapid depletion. For if oil companies were not confronted with what they believed was a credible level of taxation, they would expect future taxes on oil to be higher, and they would have an incentive to extract earlier.

It is instructive to compare Britain's experience with that of the US, which had a long established and widely owned oil industry at the time of the first OPEC shock. In the US it was politically difficult to raise the domestic price of oil, as this would have generated large windfall gains to a visible and affluent section of society whilst at the same time cutting the real income of most consumers. If the US had had in place an efficient system of rent taxes then the producers would not have gained, and the government could even have reduced other taxes as partial compensation to consumers. Given the political and constitutional power of the oil producers and oil States it was not feasible to suddenly introduce a system of rent taxes, and the endlessly unsatisfactory compromise was to hold down the domestic price of 'old' oil to producers and consumers.

Compared to the US, and indeed, many other oil producing countries, Britain was arguably quite successful in devising an effective and efficient oil rent tax. On the one hand it succeeds in transferring a large fraction (nearly 90 percent) of measured rent, whilst on the other it does not appear to have discouraged exploration or extraction, at least of the larger oil fields relevant in this period. The tax was criticised for its complexity and the large number of times it was adjusted. Certainly, instability in any capital or resource rent tax is a serious criticism, but in defence it might be claimed that the tax was being adjusted in the direction of greater efficiency and effectiveness, so that

each adjustment reduced the fear of large future adjustments. The recent sharp fall in the price of oil provides an excellent test of the extent to which the fiscal system approximates a non-distortionary rent tax. A report in the *Sunday Times*, 27 April, 1986, revealed that the Government is worried that the fall in oil prices will lead to the cancelling of exploration programmes and postponing of development. This may well be the efficient response to the reassessment of likely future oil prices, but it may also be induced by the fiscal regime, and the Government made it clear on 25 April that it "would not hesitate to make changes as soon as it became clear that developments were being frustrated by the fiscal regime." .. "One way for the government to help would be to forgo its royalty payments from producing fields; another would be to amend the tax regime and thus encourage incremental investment in existing oilfields." (*Sunday Times*, 27.4.86; p65.) The fall in oil prices would seem to provide a good opportunity to remove some of the remaining distortions from the system of oil taxation, whilst the government's expressed willingness to continue to adapt the system towards neutrality is a good sign, though it would clearly have been better to have got it right first time.

The main problem with the fiscal regime is not so much that it may have discouraged the exploitation of marginal fields (or marginal investments in existing fields) but its possible inducement to wasteful expenditure. It appears that the very high tax on profits (and hence high rate of tax relief on allowable expenditures) inside the 'ring fence' has encouraged 'gold plating' - an excessive expenditure on extraction. Certainly, extraction costs increased dramatically in real terms over this period, and the price index of capital costs has systematically outpaced price indices of produced goods. It is interesting to speculate how this might have been avoided. Perhaps a lower rate of rent tax together with a more competitive auctioning of leases might have transferred the same amount of rent in a less distortionary way, though the great problem with low rent taxes is their credibility. The oil companies know that once they have discovered the oil and installed the platform, they are vulnerable to an increase in rent taxes. The only thing deterring the Government from subsequently increasing the rent tax is the fear that it will discourage future exploration. But with a finite resource base like

the North Sea, there comes a time when this deterrent evaporates.

If the Government was forced to devise a reasonably efficient system of oil rent tax, it was under less pressure to do so in the case of natural gas, which was sold to the nationalised British Gas Corporation (BGC) under low and fixed price long term contracts. As the Energy Committee pointed out, "the fiscal regime applied to gas exploitation is highly complex and varies both with the timing of exploitation and the geographical location of the field." (House of Commons, 1985, para 85). Contracts signed before July 1975 pay a royalty of 12.5 % and Corporation Tax. After July 1975 contracts are also subject to Petroleum Revenue Tax (PRT) at 75 % with various complicated allowances. After 1 April 1982 gas fields on the Continental Shelf outside the Southern Basin were exempted from the royalty. The problem with this fiscal regime was that whilst it was quite effective at taxing the oil companies who exploited the gas and brought it to the beach, it failed to tax the rent captured by the BGC on its existing long term fixed price contracts. In other words, the value of the gas purchased by the BGC could (and did) diverge sharply from the contract price.

Valuing and pricing gas is more difficult than for any other fuel, as the high cost of transporting it makes its value at different places very different. In the case of oil, transport costs from one side of the world to the other are still small compared with its price, and landed oil has access to a unified world market. Its value can be immediately deduced from the price of comparable crudes. In the case of gas, the landed value can only be found by finding a margin at which this gas displaces some other fuel (other gas, or fuel oil), and then find its value at that margin. The landed value is then its value at the margin of substitution less transmission costs, and is often termed the net-back value to indicate its method of determination. Given the size of British reserves of gas, the net-back value was determined by the price of oil, because at some future date oil would have to replace the depleted gas. (It could be argued that by then the UK could import sufficient foreign gas to defer that substitution until an irrelevantly distant date, but it is still probable that the price of the imported gas would be linked to the price of oil.) Consequently, when the price of oil rose sharply in 1973-4, the

value of UK gas also rose sharply (though not by the same proportion.) The demand for gas also increased sharply, as did the potential profits of the BGC. Part of these were realised, but part were passed on to gas consumers in the form of lower than justified prices, and some part may well have been dissipated in higher operating costs of the BGC and its High Street showrooms. Given the considerable difficulty in calculating the value of gas, and the great secrecy about the contract terms on which the BGC negotiates to buy gas, these potential profits were obscured, and hence escaped the close attention which the tax experts in the Government devoted to petroleum taxation. Belatedly, in 1980/81 the Gas Levy was introduced, and paid by the BGC on PRT-exempt gas purchases "to secure for taxpayers a share of the benefits from early gas contracts." (House of Commons, 1985, para 85; evidence from DEN.) Nevertheless, the Energy Committee concluded that "the fiscal system for UKCS gas has evolved in an *ad hoc* fashion. . . No case could be made for devising the current system from scratch . ." (ibid, para 93).

The Government was concerned not only to tax the resource rents of oil and gas, but also that the prices paid for delivered energy (electricity, gas and oil products in particular) should be set at appropriate levels, and intervened in a variety of ways to cause this to happen. The intent and success of these interventions will be discussed below, after setting out the theoretical economic argument for such interventions.

The theoretical debate on energy policy

In the 1970's, economists were reasonably confident of the principles needed to advise on energy policy, and again it is interesting to look back on those arguments with the benefit of hindsight. All indigenous energy industries were under nationalised ownership, and the Government was required to specify how their prices should be set. All oil was imported, and its domestic price could therefore be altered by imposing excise taxes. The three main issues to address were how energy prices should be set, how investment decisions were to be made, and how to ensure the efficient management of the industries, bearing in mind the considerable uncertainties facing the industry. Welfare economics gave reasonably clear answers to the first two questions, but was silent on the

third. The question of whether the industries should remain in public ownership was not seriously considered.

The clearest statement of the principles relevant to the first two issues was provided in Diamond and Mirrlees (1971). They argued that production and investment decisions in the public sector should aim at efficiency, whilst distributional issues should be addressed by the general tax system, and not by adjusting the prices of public sector outputs alone. In the absence of market failures elsewhere in the economy, and provided that after-tax private profits and rents were negligible (strictly, zero), the public sector should face the same set of prices that the private sector faced, there should be no taxation of intermediate goods, and, unless the country were large enough to affect the prices of imports and exports, there should be no trade taxes (ie no import duties, export levies, or export restrictions.) Subsequent work showed that the government's redistributive objectives could, under not implausible conditions, be met by the system of direct taxes and transfers alone, and that differentiated indirect taxes would not be able to further improve the income distribution. If the government imposed Value Added Taxes (as it does in the UK), then under these conditions the rates should be set at a uniform level, as argued in greater detail in Davis and Kay (1985).

The practical implications of this theory have been set out elsewhere (Newbery, 1985) and can be quickly summarised. Now that exchange rates float freely, the main market failures relevant to domestic energy policy are, in order of importance and difficulty: the existence of natural monopoly in electricity and gas distribution, problems of unemployment, labour immobility and wage rigidity in the coal industry; the absence of futures and insurance markets; and problems of environmental pollution, primarily from power stations. (I am ignoring the important international aspects of energy and economic policy which are directed to minimising the disruptive effects of supply disruptions, as these do not directly affect domestic energy policy. Policies such as international agreements on the level of oil stocks to maintain, and the contingency sharing arrangements to make in the event of supply falling below an agreed trigger level necessarily involve coordination with other countries and cannot usefully

be considered in isolation. On the other hand, the residual risks which the UK faces from supply disruptions and oil price changes are relevant to domestic energy policy.)

The importance of natural monopoly in electricity and gas distribution is the main reason why these two industries are either publicly owned or regulated in almost every country. The problem of environmental pollution is conceptually straightforward - power stations should be charged for the pollution damage caused, which will raise somewhat the cost of producing electricity. The second problem of labour market imperfections in the coal industry does not have much effect on the pricing of coal, for the domestic price of coal should be set equal to the world market price of coal, adjusted for transport costs. (Strictly speaking, the spot price of coal should be set at the world price level - either import or export parity, depending as the UK imports or exports coal. The actual price paid will typically be a contract price, which will be some average of expected spot price levels.) The reason for setting the coal price at the world market price is that coal, like oil, is now an internationally traded commodity, and its opportunity cost (or alternative value) is therefore given by the world price. It does, however, directly bear on the question of the size and rate of decline of the coal industry, or, putting it another way, on the determination of which pits are 'unprofitable'. The third problem, the lack of futures and insurance markets, means that pricing signals are blunter instruments than otherwise, as they have to signal future circumstances as well as current scarcities or gluts, and also avoid large unanticipated changes. It also means that substitutes for the missing insurance and futures markets are likely to be important, specifically that long-term contracts between suppliers and large users will need to be carefully drawn up to take account of possible contingencies, such as sharp changes in the world price of oil.

It is important to distinguish three types of prices in the energy sector - the prices offered to *suppliers* (eg to an oil company for North Sea gas, delivered to the beachhead), the prices charged to an energy-using *producer* of other goods (eg an aluminium smelter for electricity, or a pottery for gas), and prices charged to final *consumers* (eg households for heating and light). The ideal price system sets the

supplier price and the producer price equal, and extracts rent from suppliers via rent taxes or lease auctions, and sets the consumer price equal to the producer price plus the appropriate rate of VAT. If, as could be argued to be the case in the UK, the system of commodity taxes does not afford the Government additional redistributive instruments to the current system of direct taxes and transfers, then the appropriate rate of VAT is the uniform rate applied elsewhere.

There is another distinction which is useful when discussing prices - that between *efficient* or spot prices on the one hand, and *contract* prices on the other. Efficient prices are the prices that would clear competitive markets at each moment, and, like primary commodity markets, which are the closest approximation available to competitive goods markets, one would expect the efficient price to fluctuate from moment to moment in response to changes in demands, supplies, expectations, and information. Contract prices would be the prices paid for the duration of a contract (either formal or implicit). One would expect contract prices to be an average of expected future efficient prices. The advantage of contracts are fairly obvious - they provide a surrogate for a futures market, with its attendant advantages of price insurance. Their limitation is that, unlike futures contracts, they cannot be freely traded and hence unwound. A futures contract has the great advantage of separating the functions of price insurance from the price signalling role. If a coffee producer is worried that the price of coffee may fall, he can sell futures and insure himself against that outcome. If in fact the price subsequently rises and makes it profitable to apply extra inputs to increase output, the producer still has the incentive to apply those inputs, for he sells the coffee crop at the spot price whilst closing out the futures contract. A contract does not provide such an incentive, unless marginal purchases or sales take place at the spot price.

Much of the confusion on pricing principles stems from a failure to distinguish carefully between efficient prices and contract prices. Economic theory typically advises on the setting of efficient prices, whilst the fuel industries are frequently more concerned to set prices which are often best seen as contract prices. In the case of gas purchases from North Sea suppliers, the contract prices are just that,

whilst for domestic gas consumers they are effectively contracts - implicit promises not to alter the price for a reasonably long period. Efficient prices are *short run* marginal costs, whilst contract prices should be *long run* marginal costs.

The producer prices of energy should then be set at the marginal social cost of production or the opportunity cost (the world price for traded fuels such as oil and coal, and the marginal extraction cost plus rent for gas, as explained in Newbery, 1985; 1986.) One can then argue about the correct time period over which the marginal cost (or world price) should in practice be measured and hence the extent to which the price actually charged approximates the efficient price or a contract price. If consumers respond quickly to price changes, and if future prices could be announced (and could be believed) then prices should be set at short run marginal cost or spot world prices. If consumers respond more slowly, and future prices cannot be credibly announced, then some average of expected future short run marginal costs or world prices, which balances errors in current consumption decisions against errors in fuel-using investments, will be preferable. This average will approximate an expected long run marginal cost.

Investment decisions are then evaluated using a Test Discount Rate (TDR). A project is accepted if the present discounted value of its incremental output, evaluated at the prices which will prevail given the pricing rules outlined above, less incremental operating costs, exceeds the incremental investment cost. Equivalently, capacity is expanded if the short run marginal cost exceeds the long run marginal cost, and capacity is optimal when all marginal costs (measured over all time periods) are equal. The only remaining problem is to specify the TDR, and here there is continuing debate. The Diamond-Mirrlees efficiency argument implies that the public sector TDR should be equal to the discount rate used by the private sector in its investment decisions, but it requires the perhaps unreasonable assumption that capital markets are efficient and do not suffer market failures. Credit rationing, itself the consequence of pervasive asymmetric information and moral hazard, casts considerable doubt on this assumption, and a variety of alternative methods exist for estimating the TDR, none fully satisfactory.

These principles, more or less those incorporated into the 1967 *White Paper*, (with the possible exception of the principles for setting commodity taxes), have not changed significantly since the early 1970's, though the Government has become increasingly disenchanted with them. The reason is simple - although the principles can guide pricing and investment decisions provided the nationalised industries are efficiently managed and minimise the costs of producing the desired levels of output, they do nothing to ensure that the industries are managed efficiently. Moreover, it is not difficult to argue that it is far more important to ensure that costs are minimised than that prices are set at the correct level. Suppose the elasticity of demand facing a nationalised industry is unity, then, roughly speaking, the welfare cost of setting the price 20 per cent too high or too low is no greater than the welfare gain of cutting production costs by 2 percent, whilst if price elasticities are lower than unity, pricing errors are less costly. It is doubtful whether the disagreements over pricing amounted to more than 20 percent, and I suspect that very few economists would have claimed that improved management, monitoring, or competitive pressure could not have been able to reduce costs by at least 2 percent.

A variety of measures have been employed by the Government to try and improve the efficiency of the nationalised industries, ranging from imposing additional profit targets to efficiency audits. (If the industries were operating efficiently and following the specified pricing and investment rules these profit targets would either be redundant or inconsistent with the application of those rules.) None seems to have been very successful, though the past decade has been a turbulent one for the energy industries, and perhaps it is too soon to pass final judgement.

The growing evidence that deregulation and increased competition could dramatically lower costs in some industries has in any case changed the nature of the debate on the best way to control the energy industries. After some modest moves to permit private competition in electricity and gas supply, the Government has privatised the oil industry and intends to privatise British Gas in the autumn of 1986. Next year the oil and gas industries will be in private ownership, competing with the still

nationalised electricity and coal industries. It is not inconceivable that in due course coal, and perhaps even electricity, will also be privatised.

After this rather long introduction, it is now time to address the main topic of this paper - how should this change in ownership of part of the energy industry affect energy policy? This in turn can be broken down into a number of questions:

1. What should be the Government's policy on competition for the fuel industries, both nationalised and privatised?
2. Should the prices of the privatised industries be regulated, and if so, how?
3. What policies for pricing, investment and management should the remaining nationalised industries follow?
4. Are there any implications for the taxation of energy?

In the following sections these questions are addressed in turn.

Competition policy

Economists appear to be in reasonable agreement that firms are induced to operate efficiently less by the nature of ownership (private versus public) than by competition or the threat of competition. (See Bailey, 1986; Kay and Thompson, 1986; and the discussion by Brittan, 1986.) The main success stories of deregulation have been in industries with few natural barriers to entry (and exit). When they were deregulated so that entry could occur, they were put under pressure to cut costs and reorganise to meet consumer demand at least cost. In the case of airlines in the U.S. the effects were dramatic, as competitive costs were sometimes less than half the inflated costs of the regulated companies. The British policy of privatisation is not designed to achieve these benefits, since there appears to have been little concern to increase competitive pressure on the privatised industries, and indeed, the Government appears instead

to believe that selling public industries as monopolies will be more profitable than the alternative of selling them after trying to increase the degree of competition. It is therefore important to realise that the fact that the Government is planning to privatise parts of the energy sector is no guarantee that the problems of management efficiency will thereby be overcome. That objective will require an increase in the degree of competition within each fuel industry (as well as between them) and/or a carefully designed system of regulation. It is worth briefly examining each industry to see what options are available, and to what extent they are being adopted.

Gas This is the most urgent case to consider as it is currently being considered by Parliament for privatisation in autumn, 1986. The most obvious option, that of selling the twelve area boards and the National Transmission System as separate entities, has been foreclosed. Had this been done, the number of companies on the buying and selling side of the upstream market for gas would have been more equal (there being about eight or so moderately large suppliers operating in the North Sea, as well as three countries - Norway, The Netherlands and Russia.) In most natural resource markets, this number of buyers and sellers might normally be expected to lead to intense competition, but it is important to realise that gas is fundamentally different from oil, for the potential market area accessible to a given buyer or seller is severely limited by the pipeline infrastructure and distance. On the most favourable scenario, in which the UK builds links to the Continental gas grid, and hence potentially allows buyers and sellers access to the widest possible market, it is unlikely that more than a few agents would be well enough placed to compete on each side of any transaction. Nevertheless, it can be argued that the increase in competitive pressure exerted on the firms when going from a single firm (like the BGC) to two competing buyers (two area boards, an area board and the CEGB, or possibly an area board and a foreign buyer) is as large or larger than going from a small number of participants to a large number. The main benefits of such a move would be to improve the efficiency with which gas exploration and exploitation proceeds, as argued more carefully in Newbery (1986).

If the BGC is to be sold intact, the first question to ask, therefore,

is whether there is any other way of exposing it to more competition in its dealings with gas suppliers. Two potential solutions have emerged - to allow gas suppliers to sell direct to UK customers, or to allow them to export gas, rather than being forced to sell to the BGC on its terms. Since the Oil and Gas (Enterprise) Act of 1982 UK suppliers have been free to negotiate direct sales to industrial consumers, though in most cases the supplier would still have to negotiate with the BGC for the use of the pipeline system to deliver the gas to the contracting customer. In practice no use has been made so far of this provision. Part of the problem is that although the Act requires the BGC to make the pipeline available to interested parties, the BGC has perhaps understandably not been in a great hurry to quote terms on which gas shipments may be made.¹ Here the two obvious steps which might improve matters are to allow gas to be used for electricity generation (this will increase the number of potential buyers large enough to make direct sales commercially viable) and to specify the terms on which pipelines are to be made available more carefully. It will also be necessary to prevent predatory pricing by the BGC designed to undercut the market for private sellers.

The second option, of allowing gas suppliers to export, appears to have been agreed in principle, though it will presumably require the supplier to provide his own pipeline link to the foreign market. Whilst this may have some effect for a few fields in the Southern North Sea, which is close to the Dutch gas gathering system, its effect is likely to be rather small. Again, to widen the market more needs to be done, and as mentioned above, the best remaining prospect is likely to be a link or links between the National Transmission System and the Continental grid, for this would allow a larger number of fields potential access to export markets. (If such a link were built, it might be attractive for Norway to use Britain as a land bridge to the Continent for its new large offshore gas fields, and as a result, Britain would gain access to an additional large source of supply, as discussed in Newbery, 1986. Whether this is still a viable prospect depends sensitively on how far future gas prices are expected to fall in sympathy with the current fall in oil prices.)

None of these proposals, even breaking up the BGC into competing Area Boards, would have much direct effect on the efficiency with which the

Area Boards transmit the gas from the beachhead to the final consumer, for each board remains a local monopolist for all except the largest consumers (who may be able to buy direct.) Nevertheless, a significant opportunity was lost in selling the BGC intact, for it would have been much easier to regulate gas prices if the Area Boards had been set up as autonomous accounting units. The best way to regulate each board would involve setting a price which is independent of the board's costs, as this preserves incentives for efficiency. The problem is how to set the price, but with twelve competing regional companies there is no difficulty - the prices to consumers in any one region can be set as a markup on some weighted average of the remaining regional companies' costs, the weights allowing for regional similarities, as well as perhaps placing greater weight on lower cost regions. Since each regional company has an incentive to minimise costs it would be difficult for them to collude and defeat the intent of the regulation. (See also the discussion in Hammond, Helm and Thompson, 1985). Whether this effect can still be achieved is considered in the next section on regulation.

Electricity The 1983 Energy Act aimed to liberalise energy supply in the UK, by abolishing the statutory monopoly for the supply and distribution of electricity. It also required the Area Boards to publish tariffs at which they would be required, subject to technical feasibility, to purchase electricity offered by private producers. The Act also permitted private producers to make use of the transmission and distribution system at published rates so that they could supply final consumers directly. On the face of it, this appears to provide just the threat of competitive entry required to keep a natural monopoly operating at least cost, but as Hammond, Helm and Thompson (1986) argue, entry conditions into the electricity supply industry involve large sunk costs and a long term commitment which greatly reduces the effectiveness of this entry threat. Suppose it were the case that a privately constructed coal fired power station located on a deepwater port using imported coal would be the least cost method of generating power conventionally, and that a private contractor would be able to build such a power station at lower cost than if under contract to the CEGB. It would then seem desirable that when the time came for the next conventional power station to be ordered, that it should be privately constructed and operated, and should sell electricity

to the Area Boards as envisaged by the Energy Act. Does the Energy Act as presently drawn up provide the right incentives for this outcome to be likely? In particular, does it provide sufficient assurance about the future terms on which the electricity output would be bought so that the private supplier can predict the profitability of the investment with reasonable confidence?

The Energy Act requires that the private purchase tariff (PPT) be based on the Area Boards' avoidable costs in purchasing from the private supplier rather than from the CEGB, which in turn is specified by the Bulk Supply Tariff (BST). If all operating decisions were based on the same principle (ie to produce electricity if the relevant part of the BST were above short run marginal operating costs) then the CEGB would have a powerful incentive to set the BST at the efficient level, and a private producer who was in fact more efficient than existing public suppliers would be able to make a profit selling at these prices, and so would be encouraged to enter. But operating decisions are centrally made via the merit order, and although they are made to minimise system operating costs, there is no strong compulsion to align the BST to the relevant marginal operating costs, since this is not used to signal operating decisions. Moreover, the CEGB has been under repeated political pressure to change its pricing structure to meet a variety of changing objectives, and there is no guarantee that this process will not continue in the future. In short, the future course of the BST and with it of the PPT is hard to predict, and this uncertainty might deter potential entrants. Nevertheless, unsatisfactory though the situation appears, it could be argued that it will not deter *efficient* entry, for the following reason. If the entrant can produce electricity at lower cost than existing power stations, and if the CEGB is required to earn a required rate of return comparable to the private sector rate of return, then it must set the BST at a high enough level that the private power station would earn a higher rate of return. Provided the CEGB is not able to place inappropriate costs into the category of unavoidable system costs, which Area Boards must pay regardless of whether they buy from the CEGB or private suppliers, then it would appear that the Energy Act offers the prospect of genuine competition.

Are there any flaws in this argument? What happens if the CEEB has excess capacity, and the Government accedes to the compelling argument for setting the BST at short run marginal cost (SRMC), at which level a new power station is unlikely to make a profit? If the CEEB does have excess capacity then entry (ie additional capacity) is presumably undesirable, and the BST will give the correct signal. (Indeed, if the BST is set at long run marginal cost (LRMC), as the CEEB claims it should be, there is a danger that entry will occur when it should not, and to that extent it is desirable that the BST be adjusted towards SRMC during periods of excess capacity.) But what if the CEEB has a built-in incentive to overinvest so that it almost always has excess capacity, and is hence protected from competitive pressures? Indeed, it has been argued that one of the main limitations of the pricing principles advocated by welfare economists and set out above is that they provide an incentive for 'appraisal optimism' when selecting new investments. The argument runs as follows. Suppose that the managers and staff of the CEEB derive utility from the size and rate of growth of the industry (because their promotion and pay prospects improve, as well as their prestige). Then there is an advantage in overestimating demand at LRMC prices and installing excessive capacity, for then efficient pricing dictates that prices be set at SRMC, below LRMC, and at these lower prices demand and the volume of output will indeed be higher. This incentive towards 'appraisal optimism' will be further enhanced if it is believed that it deters entry and hence preserves the position and size of the CEEB.

The solution to this problem is to require the CEEB to earn a required rate of return on its investment to offset this temptation, and if this is done (and is believed by potential entrants to be a permanent feature of electricity pricing and investment decisions) then entry should occur when efficient. The fact that such entry has not yet occurred may just be evidence that the CEEB is suffering from excess capacity, and will continue to do so in the near future. It may also be because no private constructor is willing to take on the massed forces of the British coal miners and port workers.

The other intriguing prospect is that French nuclear power will continue to undercut the cheapest British electricity, in which case the

least cost option for the UK would be to expand the number of cross-Channel cable links to France. If the CEGB is not willing to do this directly, then it is presumably open to Electricite de France to find a British company (perhaps a cable company) through which to sell electricity. In short, the Energy Act would seem to force the CEGB to consider this option very carefully indeed.

It might also be worth speculating whether it would be feasible to sell off the individual power stations to private operating companies whilst retaining the grid as a common carrier. On the face of it, this proposal looks quite attractive, as there were about one hundred power stations in England and Wales at the end of March 1983. However, about half the total electricity was produced by only ten coal-fired power stations, and there were nine nuclear stations supplying just under 30 percent of the total. (Bending and Eden, 1984.) Thus even at the level of the whole country, the degree of concentration would be quite high, whilst in any effective market area it would be very high indeed. Indeed, Schmalensee and Golub (1984) found that even in the U.S., where conditions appear far more favourable to deregulating the wholesale electricity market, some market areas exhibited high estimated effective concentration. This does not mean that competition is impossible, but it does mean that additional regulation would be required.

Again, as with the Oil and Gas (Enterprise) Act, the main weakness of the liberalisation proposals is that they have little effect on the efficiency with which the Area Boards deliver electricity to final consumers. Given the local natural monopoly element of the distribution system it is hard to see what further competitive (as opposed to regulatory) measures are available to improve this situation.

Coal The most obvious measure to increase competitive pressure would be to allow customers to import coal freely. In effect, British Coal has already responded to this threat by offering to sell coal to the CEGB at import parity prices. The real issue arises when planning the location of new coal fired power stations (if and when they are needed.) Provided the CEGB is free to choose their location, and can negotiate long term supply contracts with British Coal suitably indexed to competing fuels (imported

coal, fuel oil, etc.) then the threat to locate at a deep water port and buy imported coal should compel British Coal to price competitively (at least, on new contracts.) The main problem is that British Coal may continue to cross-subsidise, in which case there would be no guarantee that power stations were in fact located at least cost locations using the least cost fuel. Again, the logical next step is to remove British Coal's monopoly over the production of coal, so that new pits could be owned and operated by competing producers. Arguably, privatising British Coal by selling pits to a variety of companies would seem the logical way of increasing the efficiency of the industry. Of all the nationalised industries, coal is arguable one of the best placed on purely efficiency grounds to benefit from competitive privatisation, as each mine operates under diminishing returns, and has rather limited local monopoly power, greatly mitigated by the bilateral nature of most coal sales (to the CEGS). Whether it would adequately address the social problems, is, of course, another matter.

The regulation of the privatised fuel industries

There would seem to be no need to regulate the prices of petroleum products, since there is an active spot market in Rotterdam, and entry is reasonably easy for independants. For the immediately foreseeable future that just leaves the regulation of gas, though it might be worth speculating on the need for regulation of electricity, were it to be privatised.

There is no doubt that gas prices will need regulation, for even if it had been the intention to break up the BGC into its separate area Boards, each of these would still have had a total local monopoly in the supply of gas to most consumers. The evidence from Germany is that left to their own devices, gas boards set the price of gas about 10-20 percent above the price of domestic heating oil, calculating that the additional advantages of gas in central heating allow them to set this price without losing too many customers to the competing fuel. At least until 1986, this would have resulted in too high prices for domestic consumers, too few consumers, and monopoly profits to the gas company.

Part II of the Gas Bill proposes that the BGC should be sold intact in its present form, and is to be subject to what appears to be rather weak regulation by a Director of an Office of Gas Supply, advised by a Gas User's Council (with half the funding presently spent on the various Gas Consumers Councils.) Consumers taking less than 25000 therms pa would be supplied at an announced tariff, which from the Draft Licence (published by the Department of Energy on Dec 9, 1985) is supposed to be no higher than a Maximum Average Price. This price is calculated according to the following formula:

$$M_t = (1 + i_t - X)P_{t-1} + Y_t - K_t,$$

where

M_t is the Maximum Average Price per therm in year t

i_t is the fractional change in the RPI

X is a number to be determined (perhaps 0.02)

P_{t-1} was the allowed non-gas price in $t-1$, with P_0 specified

Y_t is the Allowable Gas Cost per therm in t

Q_t is the quantity sold to regulated customers in t

r_t is the Treasury Bill rate in t

R_t is tariff revenue from tariff quantity in t , and

$$K_t = (R_{t-1} - Q_{t-1}M_{t-1})(1+r_t)/Q_t,$$

$$P_{t-1} = P_{t-2}(1 + i_{t-1} - X).$$

The maximum price is thus made up of the Allowable Gas Cost (roughly speaking, the cost of purchasing gas, though the definition takes nearly four pages to spell out), and non-gas costs, which are linked to the cost of living with some allowance (the X factor) for presumed increasing efficiency (as with telephone rates, which escalate at a rate equal to RPI - 3%). Larger customers would not be so protected and would have to negotiate tariffs, subject to a published maximum. There does not appear to be any requirement that larger customers should pay the same for the same type of contract, nor anything to prevent cross- subsidisation, which, given the substantial rents earned on the earlier gas supply contracts, would be easy to finance, and would constitute a powerful barrier to the entry of suppliers attempting to make direct sales. The

regulation of the gas industry has been scrutinised and strongly criticised in the Report of the Energy Committee (House of Commons, 1986).

The obvious questions to ask are whether this system of price determination encourages efficiency in gas use by consumers and in gas supply by the privatised British Gas Corporation or British Gas, PLC (BGPLC). Consider first the question of efficiency in gas use for large consumers who must negotiate contracts. Most gas would be used for raising heat, in which use it is competitive with oil and coal. In the case where oil is the logical alternative one could argue that bargaining between the purchaser and BGPLC will lead to efficient fuel choice, as it is probably cost effective for users to install dual fired burners which would permit them to burn oil or gas, depending on their relative prices. (To take a concrete example, my college signed a contract to run from Feb 1986 to Jan 1987, to take between 100,000 and 150,000 therms of gas. In February, gas was cheaper than fuel oil, but in April fuel oil was about 15p/gallon cheaper than gas, and the college switched to burning fuel oil. Next year we shall no doubt either bargain for a lower gas price or a lower minimum required gas take.) Faced with an essentially elastic demand for gas at the fuel oil price, BGPLC will undercut oil provided the opportunity cost of new gas (i.e. marginal cost plus any rent in the supply price) is below the price of oil.

In the case of customers for whom coal would be the cost effective choice matters are more complicated, as it is substantially more costly to retain a dual firing capability. Here the danger must be that BGPLC would attempt to offer an initial contract which made gas attractive relative to coal, but once the investment decision had been made in favour of gas, it would then replace the contract by one less favourable. A shrewd purchaser would be well advised to insist on a long term contract linked to the price of coal, preferably with a low minimum take, to allow subsequent switches to oil if that proved cheaper. Provided larger customers were reasonably intelligent in negotiating contracts, the system would seem to encourage efficiency in gas use, though there is a case for Ofgas to collect and publish the terms of existing contracts to increase the transparency of the market and to correct any imbalance in bargaining power between relatively smaller buyers and the monopoly gas supplier.

In the case of the regulated market, prices are related to the average cost of purchasing gas, and when examining whether this will lead to efficient gas use, four questions are important. First, whether prices should be based on the average cost of gas, second, whether the formula allows predatory pricing against alternative fuels, third, whether BGPLC will have adequate incentives to hold down the cost of aqua and fourth, whether the formula gives the regulated market adequate protection against 'unreasonable' price increases. The answer to the first question is that theoretically, gas prices should be related to the opportunity cost of gas use, and there is little reason to believe that the present average cost of gas approximates this opportunity cost at all closely. A substantial fraction of currently supplied gas was purchased in the past under long term contracts at favourable prices, well below the cost of replacement gas, and hence well below its opportunity cost. The Gas Levy was an attempt to increase the cost of gas delivered to the BGC somewhat towards the correct price, but it is a very blunt instrument for the purpose. Probably the best solution would be to change the basis on which the Levy were calculated, relating it to the difference between the past contract price for 'old' gas, and some formula designed to measure the opportunity cost of the gas. Ideally, one would search for an observable market price for new gas contracts sold to buyers other than BGPLC, but the gas market is notoriously opaque. An alternative would be to take a weighted average of the price of new contracts signed by the BGC, and the index of fuels used in typical contract escalation clauses.

The second question is whether the formula allows predatory pricing against other fuels, and here the answer appears to be a qualified yes. Suppose that other fuel prices were suddenly to fall, making electricity or heating oil the efficient choice for customers installing central heating. It is open to BGPLC to match these price cuts for several years, and then to recoup the lost revenue by raising prices sharply later. The formula given above has the property that if BGPLC makes a shortfall in its revenue in one year, it can recoup it plus interest in subsequent years. BGPLC is thus indifferent to a lower revenue this year, because the present value of the extra revenue allowed in the future is equal to the loss now. The advantage of matching price cuts is that some consumers

will make the incorrect choice (of gas), and once they are locked in, they can be squeezed, and will regret having made the choice. The regulations carry the provision that if BGPLC underprices gas by more than 90 percent for two years running, then it may not be able to recoup the loss, and this will dampen the incentive to predatory pricing. The obvious solution to this problem is for Ofgas to publish forecasts of future gas prices, so that consumers can take informed long run decisions when buying fuel using equipment.

The third question was whether the ability to pass on increases in gas costs to the regulated consumers unduly weakens the incentive of BGPLC to negotiate an efficient contract with the gas suppliers past the BGC has been criticised if anything of exercising too much monopsony power in bargaining with gas suppliers, and as a result discouraging exploration and efficient depletion, as well as transferring rent from the Treasury (as PRT and other taxes) to the BGC, where it is taxed less heavily, or to consumers, where it is taxed not at all. Whilst the earlier system can be criticised, the proposed alternative appears to go to the other extreme. One possible solution is to allow BGPLC to recover 90 percent of the amount by which the Allowable Gas Cost exceeds the initial, indexed Allowable Gas Cost. (This would introduce a symmetry in the effective tax rate of profits/rents accruing to the gas producers and BGPLC.) In defence of the present system, it might be argued that BGPLC has an incentive to minimise the cost of new contracts because it retains the difference between its gas costs and the prices charged to the unregulated consumers, and it may be that this provides sufficient incentive to keep gas costs down, without the need for the 90 percent cost recovery factor.

There are two additional aspects to setting the beachhead price of gas which are worrying. The first is that there is an incentive for BGPLC to shift non-gas costs onto the gas producers, since these can then be recovered in full. The costs most likely to be shifted are those of storage and managing the seasonality in demand, which might require BGPLC to invest in expensive facilities that could not be directly recovered through the pricing formula. If the gas supplier provides them, and charges for them in the contract price then they can be recovered, but this might be a much less economic solution from the national viewpoint.

The other point is that there may be an incentive for BGPLC to *underprice* gas from its own fields, to avoid the heavy rent taxes. Although it would not be able to recover these lost rents on sales to regulated customers, it could on sales to the non-regulated sector, and since the fraction of non-regulated sales is substantially larger than the fraction of rent retained after PRT, this form of transfer pricing will be attractive. naturally the Treasury is concerned that gas sold by subsidiaries of BGPLC to BGPLC be fairly priced, but given the complexity of valuing gas contracts this might be difficult to police.

The fourth question was whether the pricing formula allowed BGPLC to raise prices 'unreasonably' to the regulated market, to which answer seems to be no. In the case of British Telecom, the tariffs cannot on average exceed the formula amount, but if the charges to large customers are cut in response to competition from Mercury (as appears to be happening) then BT is free to raise the charges to private subscribers. As I understand the definition of the Maximum Average Price, it refers to quantities and revenues sold and earned in the regulated market alone, so that price cuts in the nonregulated market would not justify price increases in the regulated market. It is obviously important to check that this interpretation is correct, for if the average refers to total sales in both the regulated and unregulated markets, then if BGPLC cuts its price to the nonregulated market in response to competitive pressure, it would be able to increase its price to the regulated market, with little fear of losing many customers, most of whom are locked in by their past investment decisions. Whilst this may not lead to inefficiency, it will certainly be resented, and would reflect a presumably inequitable transfer from consumers to the equity shareholders of BGPLC.

The final issue to address is whether the regulatory system provides adequate incentives for efficiency in gas supply, and here the proposal is to adopt a scheme rather like the British Telecom pricing formula, where the maximum price assumes a predetermined rate of cost reduction in real terms, as yet to be decided. In principle, this is superior to a cost based system, since BGPLC derives the full benefit of faster cost reductions. The difficulty lies in determining the rate of cost decline (the value for 'X' in the pricing formula). Not too much should be made

of this, however, for it will take many years before the discrepancy between estimated and cost minimising costs becomes large, and small discrepancies have a negligible efficiency cost, and consists largely of transfers between gas consumers and gas shareholders. If the discrepancy becomes embarrassing, the Act contains provisions for revising the formula, and this should provide an adequate safeguard. The main implication is that the Government should ensure that there is competitive tendering for the shares so that any underestimate in the value of 'X' which makes the profitability of BGPLC higher is recouped in higher receipts from the sale of shares.

Pricing and Investment Policies for the nationalised fuel industries

Once gas is privatised and allowed to price essentially as it pleases in the unregulated market, should the other fuel industries be given the same powers? In the case of coal, this is presumably already the case, so the issue only affects electricity, where at the moment it is required not to discriminate between essentially similarly placed purchasers. The argument for not worrying unduly about the ability of the BGPLC to price discriminate was that gas faces close competition from coal and oil as an underboiler fuel, and sensible purchasers will use that fact in negotiating efficient contracts with the BGPLC. This argument applies much less strongly for electricity, which, for many applications has no close substitutes, and hence represents a captive market with high entry barriers. There would thus appear to be good grounds for continuing to insist on non-discriminatory pricing for electricity.

More radically, should the Treasury abandon its required rate of return, which is a profits based system of price regulation, and replace it by a maximum allowable price as for gas and telecommunications? If so, should it allow managers to receive some fraction of their salary as a share of the resulting estimated profits? On the face of it, the idea has obvious attractions, and might go some way to avoiding the excessively capital intensive nature of electricity supply in the UK. It would also seem appropriate to then allow the Electricity Supply Industry direct access to capital markets, perhaps at the same time removing the Treasury underwriting, so that the 'discipline of the capital markets', argued to

be so good for the other privatised industries, could also be applied to the electricity industry.

Another issue to consider is whether the CEGB should be free to use gas in power generation, and again, there seems no good reason for not allowing this. Indeed, now that private companies can supply electricity, one might well expect that companies with access to cheap gas (or gas with a low opportunity cost) might use it to generate power, and it would be illogical to prevent the CEGB doing likewise. There is the additional argument that it might be attractive for the CEGB to operate gas-fired small scale combined heat and power systems for large consumers. The economics of these schemes looks attractive at the rates of discount used by the CEGB, but much less attractive at the rates of discount which firms apparently use when making energy conservation decisions. It has therefore been suggested that the CEGB build and operate the systems, selling heat and power to the firms (or, equivalently, leasing them the plant.) The potential market amounts to about 4 percent of the current generating capacity of the CEGB, with the attraction of a much shorter lead time in construction.

The taxation of energy

Two key reforms are long overdue in the energy sector. First, the taxation of rent is, outside the oil industry, in an unsatisfactory state, and second, the taxation of energy consumption has serious shortcomings. The issue of rent taxation has already been touched on, and primarily involves the taxation of the rent on old gas contracts which accrues to consumers, and not to the Treasury. A modified Gas Levy, as described above, would solve this problem. Alternatively, the Treasury could auction the rights to the existing contracts to oil companies, who would then be free to renegotiate new contracts with the BGPLC. There is also the anomaly that British Coal collects the royalties on privately operated coal mines - primarily the open cast pits. Logically the Treasury should set and collect such taxes, and again, logically, they should be rent taxes rather than royalties.

The taxation of energy consumption is one of the main instances where

the British Government appears not to have heeded the advice of Diamond and Mirrlees (1971). At the moment some intermediate goods (heavy fuel oil) are subject to an excise tax when they should be subject only to VAT, whilst other final consumption goods, notably gas and electricity, are zero rated. The fuel excise duty should be abolished, and VAT at the standard rate should be imposed, with compensating adjustments to supplementary benefits and the level of tax thresholds to offset any adverse distributional impacts. (Davis and Kay, 1985, demonstrate what consequential changes would be needed to achieve this purpose.) The whole issue of protecting vulnerable energy consumers from hypothermia is best addressed through the system of benefits, not through concessionary pricing.

It might be argued that it would be political suicide to impose VAT on fuels, but it is hard to see the force of this argument. At the moment, the Government effectively forces the Electricity Supply Industry (ESI) in particular, and to some extent the BGC, to act as covert tax collection agencies, for the External Financial Limits and the financial targets effectively force these industries to raise prices in order to meet the required targets, even though on efficiency grounds they may feel that there is no case for so doing. The political attraction of this may be that the tax is not perceived as such, but merely evidence of the unsatisfactory nature of nationalised industry performance, but the economic cost is that whilst it is logical to raise prices to final consumers, it is damaging to raise them to producers. Consequently, the ESI is under pressure from industrialists to offer concessional tariffs to enable them to compete effectively in world markets, given that their competitors in Europe face lower energy prices. This could be done by abandoning the rather important principle of non-discriminatory pricing, but it would be far better to address one of the sources of the problem, namely the unsatisfactory system of taxing energy consumption. If the Government were to introduce VAT either at a time of falling fuel prices, or in exchange for relaxing the External Financial Limit, then domestic prices need not rise, whilst producer prices would, and everyone would be happy.

The only exception to the rule of exempting fuels from excise duty

applies to motor fuel, where the excise duty is properly seen as a road user charge.

The coordination of energy policy

The old view of energy policy attached high priority to the need for coordinating the decisions of the different fuel industries. Is this still an important objective, and, if so, how is it to be achieved when a growing fraction of energy is under private control? At the moment the main need for coordination is between the CEGB, British Coal, and the nuclear power industry, all of which remain under public control. The likely scale of gas use in electric power generation in the foreseeable future is sufficiently small that it is unlikely to require much sophisticated coordination, over and above the natural coordination that would arise in drawing up long term contracts for gas supply to the CEGB. This leaves the main problem as the old one of forecasting the demand for British coal by the CEGB, and, given the lead times in power plant construction, it is as easy for British Coal to make this forecast as for the CEGB - the uncertainties on future relative fuel prices (which determine the merit order and demand for coal) are as difficult to resolve for either party. It is open to both to negotiate long term contracts which share these risks. The real source of the difficulty lies in managing the coal industry, and dealing with the social problems and market failures in the labour market - a problem that has less to do with coordination than control.

An interesting test is provided by the dramatic fall in the price of oil from nearly \$30 per barrel in 1985 to about \$12 per barrel in April, 1986. If coal is to be competitive in power stations at this price it will have to be delivered at a price of about £38 per tonne. The current average delivery price to the CEGB is about £45 per tonne, and even at this price a number of pits are still unprofitable (at market prices). At £35 per tonne, the London Business School calculates that the industry breakeven output would be only 68 million tonnes per annum, employing only 110,000 miners. (*The Times*, 28.4.86, p17) What in these circumstances should happen to the price of coal delivered to the CEGB, the quantity of British coal used in electricity generation, and the price of electricity?

The answer to the last question is in principle easy and given by the standard welfare economic arguments outlined above. The efficient price of electricity is the short run marginal cost of producing the level demanded at the prevailing world prices for the marginal, least cost fuel. Whether the marginal fuel is oil or coal is not immediately obvious - presumably there is not enough oil-fired and nuclear capacity to meet peak demand, and so it may be coal, assuming that the import price of coal is above that of oil on a thermal equivalent basis. The world price of coal is likely to fall partially in response to the fall in world oil prices, and so this is not much comfort to British Coal.

The efficient price for British coal will continue to be equal to the relevant world price of coal, and if, as seems likely, the oil burn of the CEBG increases, then coal is likely to be in export surplus and will have to be exported, perhaps at very disadvantageous prices. Consequently the efficient price of British coal will be the (low) export price level, and at this level the CEBG will presumably wish to continue to buy a large fraction of its previous purchases. The price actually paid for the coal is in a sense a relatively minor issue, as it is a straight transfer from one nationalised entity to another - the question will be who should show the losses arising, and how should they be financed. Provided the actual price paid is seen in this conventional way, and has no consequential effects on future production decisions, then little is at stake.

The final issue is the effect the fall in oil prices has on the future scale of the coal industry, and here what is needed is a reappraisal of the likely future price of oil (and of the probability distribution around the forecast), together with a recalculation of the rate at which to reduce employment and output in the coal industry. The interesting question will be how to appraise new pits which offer potentially lower production costs. On the one hand low current oil and coal prices must increase the prospect of higher future oil (and coal) prices, and hence make deferring development attractive, whilst on the other the opportunity cost of miners available for transfer to new pits now might be well below their future opportunity cost, arguing for maintaining greater continuity in developing new pits.

Conclusions

The indirect aim of this paper was to argue that the old principles of pricing and investment continue to apply, though they need to be supplemented by explicit incentive mechanisms to ensure management efficiency. These basic principles indicate that the system of taxation still needs adjustment, and that further improvements can probably be made to increase the competitive pressures acting on the energy industries.

Footnotes

1. There appears to be little change in the rules governing the obligation of the BGC to ship gas through its pipelines, and no obligation for them to publish tariffs for gas shipment, though the BGC is to be required to publish illustrative tariffs which would indicate to producing companies the tariffs to expect. Clause 19 "empowers the Director (of the Gas User's Council) on application of a potential pipeline user to give the public gas supplier directions securing to the applicant the right to use a pipeline owned by the public gas supplier subject to such payments as may be specified." Whether this would be enough to force the BGC to actually quote terms within a reasonable timeframe is unclear. There is apparently no mention of any change in the right of producers to export or import gas - this remains subject to the approval of HMG.

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