Surrey Energy Economics Centre

Discussion Paper Series

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THE INTERNATIONAL COAL MARKET

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October 1987 SEEDS No.37

This is an amended version of a paper given in September 1987 at the Oxford Energy Seminar.

ISBN 1852370203

1. SCOPE OF THE PAPER

Each year the world now produces and consumes over 3 billion tonnes of hard coal (bituminous coal and anthracite) and more than a billion tonnes of lignite and sub-bituminous coal. That is the equivalent of approximately 2.3 billion tonnes of oil a year, or about 47 million barrels a day, and so is over three quarters the size of world oil consumption (60 million barrels a day).

In some ways the coal market looks familiar to anyone used to studying the world oil market. For instance, prices have generally been declining over the last six or seven years under the influence of considerable excess capacity in coal production and associated activities. Indeed, since 1973 the direction of change of coal prices has generally been the same as in crude oil prices, though the amplitude of coal price changes has been less than in oil. Nevertheless, there are significant differences between the two markets. One of the most important is that there is, in a real sense, a 'world market' for oil, imperfect though it is and loosely-connected though at times it may be. In the case of coal, only a small proportion of output enters world trade and international influences on the principal country markets are less.

This paper begins by setting out the salient features of the world coal market in the context of the world energy market. It then discusses a number of the factors which will determine how the market moves in the future and concludes with some remarks on what the future may hold.

2. COAL IN THE WORLD ENERGY MARKET

Table 1 demonstrates the place of coal in the world energy market. It traces world consumption of marketed energy, using the BP oil equivalent conversions, over two periods divided by the watershed year of 1973.

Period 1 (the thirteen years before 1973) is typical of the early post World War Two years. World energy consumption was rising at about 5 per cent per annum (that is, at a rate which would double consumption every 14 years) oil and gas consumption were increasing particularly rapidly at over 7 per cent per annum consumption of hydro electric power was rising at about the same rate as energy consumption as a whole and nuclear power, though growing fast, was a negligible fraction of world energy supplies. Coal consumption during these years increased very slowly - about 1 per cent a year - so that its share of world energy dropped sharply, from nearly 47 per cent in 1960 to about 28 per cent in 1973. The reasons for the widespread substitution of coal by oil and gas in the 1960s and early 1970s are well-known. Both oil and gas have significant non-price advantages over solid fuels and as their prices declined relative to coal prices, there were very strong substitution incentives. Because of the inertia of

energy markets (of which more later) substitution effects take many years to work through the system but they are very powerful. They are also quite complex because price changes stimulate technological changes in the consumption, production and transportation of fuels which can greatly widen the range of uses of a fuel which retains a price advantage over a long period. That indeed is what happened to oil in the postwar period up to 1973 when it came into widespread use for steam-raising as well as for transport, and displaced coal as the principal basis for the chemical industry.

Since 1973, world energy consumption trends have, of course, changed significantly in response to the change in relative price movements. The rate of growth of total energy consumption has more than halved to less than 2 per cent a year. Oil consumption has, on balance, grown not at all since 1973 though this apparent stability conceals two sub-periods up to 1979 there was still slight growth in world oil consumption, but thereafter, apart from 1986, it has been downhill all the way. Oil's share of world energy has dropped substantially from 47 to 38 per cent, which is about where it was in the early 1960s. Gas consumption has kept on increasing a little faster than total energy consumption, so that its market share has risen somewhat to about 20 per cent. Nuclear power has increased its market share to around 5 per cent and the share of hydroelectricity has risen a little to nearly 7 per cent.

The feature of the Table with which this paper is most concerned, however, is the changed trend of world coal consumption. Before 1973, coal consumption was rising slowly and coal's market share declined year after year. Since 1973, coal sales have increased faster than total energy consumption and its market share has increased from 28 to 30 per cent. That is a comparatively small movement but it contrasts with an apparently well-established and strong downward trend to 1973. The main determinant of the changed trend has been the fall in the price of coal relative to other fuels (particularly oil). Before discussing price effects, however, we need to examine coal consumption in more detail and to consider also coal production and trade.

3. COAL CONSUMPTION

Table 2 shows changes in coal consumption, by principal consuming countries, from 1973 to 1986, ranked by size of absolute change. For comparison with Table 1 the units of measurement remain tonnes of oil equivalent. The most striking feature of the table is its demonstration that well over a third of the increase in world coal consumption since the first oil 'shock' was in China (which is now far and away the world's biggest coal consumer). China and the United States in 1986 accounted for over 40 per cent of world coal consumption. At the margin they were even more important; between 1973 and 1986 over 50 per cent of the increase in consumption took place in those two countries. Considerable expansion in absolute terms occurred also in the

Soviet Union and other centrally planned economies. Coal consumption rose substantially in percentage terms in South East Asia (where it has trebled since 1973) and South Asia (where it has doubled). In two other countries which, as we shall see, are export-orientated coal producers - Canada and Australia- consumption also rose very considerably in percentage terms.

4. COAL PRODUCTION AND TRADE

In recent times the countries in which coal consumption has increased have been those in which production was also expanding in general, rising coal consumption has been met from indigenous sources. Thus, the impact on international trade of growing world coal consumption has been limited.

Table 3, which is expressed in tonnes of hard coal and lignite, shows the country distribution of world coal output in 1986. The ranking is by volume of hard coal production. It illustrates the dominance of three countries - China, the United States and the Soviet Union - in world coal output. Between them, they produce about two thirds of the world's hard coal. By comparing Tables 2 and 3 we can observe that the countries which produce large amounts of coal consume large amounts of coal.

World trade in coal has increased quite rapidly in percentage terms in recent terms but it is still small relative to world output. Since 1978, world coal consumption has increased by over 650 million tonnes. Although over this period world coal exports were increasing at an average rate of about 6.5 per cent per annum compound, the absolute increase was only some 130 million tonnes (approximately 20 per cent of the increase in consumption). World coal exports of 336 million tonnes in 1986 (Table 4) compared with about 200 million tonnes in 1978, but expressed in terms of their share of production they had increased only from 8 per cent to 10 per cent. Seaborne coal trade in 1986 (that is, excluding the tonnage which moves overland, by barge or over lakes) was 276 million tonnes or about 8 per cent of hard coal production.

Table 4 shows that in 1986 the two main importing regions were Western Europe and Japan substantial quantities also moved into the rest of Asia and to Eastern Europe. There were two big exporters - Australia and the United States. Four other countries exported smaller but still substantial amounts - South Africa, Poland, Canada and the Soviet Union. Two of the smaller exporters (China and Colombia) have recently been increasing their exports rapidly. Trade growth in the last few years has been in steam coal, rather than coking coal which was the principal type of coal traded until the late 1970s. In 1986 about 52 per cent of internationally traded coal was steam coal.

5. THE NATURE OF THE 'WORLD MARKET'

The very small scale of trade relative to production in the world coal market distinguishes it from the world oil market where about 50 per cent of production is traded. Coal is more like natural gas (about 13 per cent of production traded) in this respect. The major producers are either coal self-sufficient (China and the Soviet Union, for example) or have marginal export surpluses like the United States which has recently been exporting about 9 per cent of output. There are few producers of any consequence which are export-orientated in the sense that they sell more of their coal abroad than at home: Australia and Canada do so, as now does Colombia, whilst some other middle-sized producers such as South Africa and Poland depend significantly on exports. Another complication is that over 50 per cent of world coal consumption is in 'centrally planned' economies which are less immediately responsive to price variations and other market pressures than are coal markets in Western economies.

Consequently, the world coal market is really a collection of individual markets, rather loosely connected by a world coal trade which is marginal as far as most of the producers are concerned. 'Local' factors are thus very important in considering the world coal industry. Nevertheless, one must bear in mind that what may appear to be 'local' factors in the short run - such as the Chinese government's coal expansion programme- may in the longer term have very significant spillover effects into the international market[1].

6. COMPETITION AND PRICES

Although world trade in coal is small, it is growing fast, especially in steam coal. Furthermore, many of the characteristics of a competitive market are present in international coal. Reserves are widely dispersed among countries so there are many producers; ownership of reserves is, on the whole, not too concentrated though obviously in some countries (not only those which are 'centrally planned') coal industries are centralised and subject to extensive government influence; there are no great barriers to entry; the product, though not homogeneous, can be classified according to defined characteristics such as calorific value and sulphur content and there are close substitutes for steam coal such as fuel oil, natural gas and nuclear power[2].

A very important feature of the industry in recent times has been the high ratio of unavoidable to avoidable production costs. During the days when many people believed that the world faced long term 'energy crisis', with fuel prices rising into the indefinite future, there was a great deal of investment in new coal supply facilities. Throughout the coal supply chain, ranging from exploration and production through transportation to use by the consumer, investment increased in the belief that coal

would be a 'bridge to the future'[3]. Consequently, fuel market adjustment - through increased supplies and reduced consumption- left the coal trade, like other fuel trades, with substantial excess capacity. The recent trend of international coal prices has been very significantly influenced by the presence of producers with surplus capacity and thus heavy sunk costs in this relatively capital-intensive industry. As in all industries in such situations, producers will continue in production so long as they can meet their avoidable costs; thus, supply is highly inelastic with respect to price in the short run. Since short run demand is also inelastic with respect to price, intra-industry competition depresses the price level without greatly increasing consumption. That has been the story in world coal in recent times. International coal prices fell, though not as much as crude oil prices, in early 1986. But, instead of recovering subsequently, they kept on declining. Until recently, South Africa (where coal producers had benefited from the depreciating rand against the dollar) appeared to be setting the international coal price level. However, as the export-orientated mines of Colombia have come into production, competition from them has depressed prices further. The growth of Chinese exports is now having a similar effect. Many coal producers around the world now face serious financial difficulties - particularly in New South Wales where mines have been closing.

According to the International Energy Agency, the average cif value of steam coal imported into the EEC increased from about $43 per tonne in 1978 to around $62 per tonne in 1981-82, then fell to $45 per tonne in 1984[4]. Prices kept on falling during 1985 and 1986 and dropped again in 1987. By mid 1987 it was possible to buy low sulphur steam coal cif in the ARA ports for about $28 per tonne, which is about 20 per cent lower than in mid 1986 and 35-40 per cent less than in mid 1985. Reports suggest that some coal has been offered at around $25 per tonne cif Europe[5]. Strikes in Australia may help to lift prices in the short term and there could be a similar effect if the US Mineworkers take strike action when their three year contract comes up for renewal. But, these short run effects aside, participants in the international coal trade seem to feel that depressed prices will be a feature of the market for some time yet. We return to price prospects later.

Before doing so, however, we need to consider some of the factors which will affect the future of the world coal market, beginning with general influences on coal consumption, since the trend of consumption is critical in determining how long the present surplus will persist. We can then discuss very briefly influences on supply and specific factors affecting what happens in the big, essentially self-sufficient coal producing countries.

7. COAL CONSUMPTION TRENDS

In the late 1970s and the early 1980s the consensus projection of world coal consumption was for growth of 4-4.5 per cent per annum to the end of the century. Such consensus as now exists is for 2-2.5 per cent growth which - possibly by chance - is very close to the actual growth rate of world coal consumption in recent years (Table 1). Of course, a halving of the expected compound rate of increase makes a very big difference to forecast coal consumption at the end of the century. It would be around 4.5 billion tonnes a year as compared with the projection of 6-7 billion tonnes a year in the 1980 WOCOL forecasts.

At the risk of some simplification, there appear to be three general important determinants of world coal consumption:

- the rate of economic growth
- the price of coal relative to other fuel prices
- the perceived environmental effects of coal relative to other fuels.

7.1 Economic Growth

From 1950 to 1973, world economic growth (measured in national product terms, as far as that is possible given the differences in definitions and measurement methods around the world) averaged approximately 5 per cent a year. Subsequently it dropped to nearer 3 per cent a year. If oil prices stay around their present level for a few more years world growth may speed up a little but for the purposes of this paper we can assume it will be in the region of 3-3.5 per cent a year up to the end of the century.

7.2 Relative Fuel Prices

Relative fuel prices merit much more discussion because of some key characteristics of fuel markets which determine the speed and the extent of adjustment to relative price variations. The evidence of the last fifteen years indicates that such variations set in motion very powerful forces of change which, however, operate with long time lags. In more technical terms, elasticities of demand with respect to price are very low in the short term but much higher in the long run.

The fundamental reason why fuel markets do not adapt more quickly when they are disturbed relates to the complementary nature of demand for fuels and the equipment which uses them[6]. Since consumption of a fuel necessarily implies possession of an item of fuel-burning equipment, the presence of a stock of fuel-burning equipment imposes a degree of inertia on fuel markets. Most consumers have appliances which are specific to particular fuels. Consequently, a decision to switch from one fuel to

another implies investment in fuel-switching. Even a big change in relative prices (such as the first or second oil 'shock'), will not immediately stimulate such investment on a large scale. The short run demand response to such a change is essentially confined to consumers with multi-fired equipment, those with big multi-fuel systems (such as large electricity generating utilities) and to those which can make 'housekeeping' changes to reduce fuel use with no significant investment (for example, by substituting labour for fuel).

Before consumers will switch fuels on a large scale, a new set of price expectations has to be established since investment decisions depend on relatively long run price expectations, not on what prices happen to be at a particular point in time. Depending on circumstances, it may take some months or even years before expectations change. For example, it seems probable that it was not until after the second oil shock that the bulk of consumers in industrial countries were persuaded (mistakenly as it turned out!) that relative oil prices were set on a decisively upward trend.

Once expectations have changed, consumers still have to decide whether it is worthwhile to invest in fuel-switching. In 1979, for instance, a consumer with oil-burning equipment might have decided that converting to coal was not a good investment. The capital he had invested in (say) an oil boiler would have been regarded as a bygone or unavoidable cost, irrelevant to a decision whether or not to convert. The conversion decision would have been taken excluding such sunk costs, using a comparison of avoidable costs only - the operating costs of the oil-fired equipment with the capital plus operating costs of the new coal-fired equipment. Such comparisons are plainly loaded in favour of retaining existing equipment so, in the short term, switching is limited. As time passes, however, the stock of equipment ages and its running costs will increase compared to newer, perhaps technically-superior equipment. Thus the rate of replacement will increase. Consequently, consumers may respond many years after the event to relative price changes. The characteristics of the equipment stock itself will also respond, after a time lag, to relative price variations. Increased oil prices obviously gave an incentive to design equipment which conserved fuel. Moreover, technological advances began to occur in coal-fired equipment (such as automatic handling of fuel and residues) whereas for many years previously all the incentives had been for manufacturers to concentrate on improving oil-fired equipment.

Another reason for inertia in fuel markets is that the infrastructure of an economy tends to become geared to the use of particular fuels - as it did to the use of oil during the period 1950-1973. If oil consumption is increasing rapidly, the transport system will be devoted primarily to moving around oil by road, rail or pipeline. If oil suddenly becomes more expensive, as it did in the 1970s, it will take time for the infrastructure (which embodies very large sunk costs) to adapt to the relative price change.

Thus adjustment to market disturbances - which elementary economics textbooks still portray as occurring quickly, if not instantaneously - is a long drawn out process in fuel markets. The so-called elasticity of demand with respect to price is an apparently simple measure which conceals a very complicated process of economic, social, technological and often political adaptation.

Because of the long time lags on the demand side, we can be fairly confident that the full impact of the oil shocks of the 1970s has not yet fully been absorbed. The inertia of energy demand has been very apparent since 1973: although, as Table 1 shows, substantial changes in patterns of energy use have now occurred, they were a long time coming. The market reaction to falling relative oil prices in the earlier postwar period seemed to occur more rapidly, most probably because the stock of fuel-using equipment in the industrial countries was run down during the Second World War and was ripe for replacement in the 1950s and 1960s. But by the early 1970s large numbers of consumers had converted to modern oil-using equipment and adjustment to oil price increases was bound to be slow. Given the inherent time lags, there is probably some switching to coal still to come as a consequence of the oil shocks, although decisions whether or not to move to coal have undoubtedly been complicated by the precipitate fall in crude prices which occurred in 1986 and which has introduced considerably more uncertainty into price expectations than had previously been perceived.

A key market is power generation which accounts for no less than 60 per cent of coal sales worldwide. Because fossil fuel power stations can have lives of forty years or so, it is possible that well into next century utilities will still be replacing oil stations by coal stations as a consequence of the oil shocks of the 1970s whether or not they actually do so will, of course depend on relative fuel prices between now and then and on consumers' price expectations. Let us abstract from short term effects such as last year's increase in fuel oil sales to existing power stations as oil prices tumbled. If crude prices again drop below about $15 per barrel and fuel oil prices maintain their present relationship to crude prices, there will be similar surges in oil demand. But long term effects are our main concern.

One result of the oil shocks of the 1970s was to make most electrical utilities effectively rule out any new oil-fired power stations on price and security grounds. Competition for new power plants therefore has, since the mid 1970s, been between coal and nuclear power. Nuclear programmes in the 1970s and early 1980s were generally formulated on the assumption that fossil fuel prices would rise indefinitely. However, that belief was shaken by the drop in prices early in 1986 and nuclear programmes are being re-assessed for that reason. No longer does one hear such confident predictions that nuclear power is the cheapest method of generating base load electricity.

Nuclear plans are also being re-examined because of the Chernobyl accident. Any utility which does decide to cut back its nuclear programme (or whose political masters decide for it, since power station building decisions are heavily politicised) is more likely to go for coal rather than oil. That is because, rightly or wrongly, fears still linger that imported oil is an insecure source of energy supply and because of anxieties about possibly big oil price increases in the 1990s. Coal prices, despite their ups and downs, have been less volatile than oil prices and, because of intra-industry competition, they have continued to fall despite the recovery in crude prices since late 1986. Electrical utilities may well feel that, over the lifetimes of power plants constructed in the near future, their fuel costs will turn out lower if they use coal rather than oil. Paradoxically, therefore, although there was some short run reduction in coal sales for electricity generation as a consequence of lower oil prices in 1986, in the long term power generation coal sales may be higher than they otherwise would have been.

7.3 Environmental Constraints

Discussing coal sales to electrical utilities without taking into account environmental constraints is obviously unrealistic. Coal-fired generation of electricity is perceived to be one of the principal sources of damaging emissions to the environment. Nevertheless, coal does not arouse such adverse reactions as does nuclear power. It might eventually do so. If, for instance, there are large numbers of coal-fired power stations built in the next fifteen years, there could in the early years of next century be widespread fears about carbon dioxide releases. But, for the time being, coal-fired generation is not so hampered as nuclear power by environmental fears and worries about safety.

There are also differences in political effects. In the case of nuclear power, and especially in the aftermath of Chernobyl, governments have to deal with objections primarily from their own electorates; whereas to the extent that atmospheric emissions from coal stations are perceived to create trans-boundary pollution it is other governments' electorates which raise the objections and the political calculus makes such problems less urgent.

It may well be many years before electrical utilities feel clear about how environmental regulations about coal-burning will settle down. Although many of the technologies are known and to some extent the costs of applying them can be estimated, the benefits of application are less clear. It is notoriously difficult to collect convincing scientific evidence on long run environmental effects so that cost benefit analyses can be carried out. Moreover, some measure of international agreement is required if effective action is to follow. Despite such uncertainties, electrical utilities which are, for different reasons, wary of both nuclear and oil plant and yet require new

capacity to meet expected load growth, may well conclude that their best way forward is to construct new coal-fired stations which incorporate best-practice clean-up technology.

7.4 Conclusions on Consumption

It seems very likely that the revival of world coal consumption which has occurred since the oil shocks of the 1970s has yet some way to go. Energy markets have still not fully adapted to those shocks. Particularly in electricity generation, there are good growth prospects for coal because of perceptions about future relative fuel prices and because of the perceived greater riskiness of investment in nuclear power stations post-Chernobyl. There was a slight setback to the growth of world coal consumption last year when it rose only about 1.5 per cent. That setback will probably prove to have been temporary and world coal consumption will most likely increase a little faster than world energy consumption between now and the end of the century. The extravagant hopes of the early 1980s - of 4-4.5 per cent per annum growth in world consumption - are very unlikely to be realised. But 2-3 per cent growth seems a reasonable possibility, with world steam coal trade continuing to rise at a faster percentage rate than consumption.

8. THE SUPPLY SIDE

The supply side of world coal markets is no less complex than the demand side and there are similar inherent long time lags. To be brief, the time lags have two origins. First, there are the lengthy planning and development processes associated with exploring for, appraising and developing coal reserves and constructing associated port and transport facilities. In themselves, these processes ensure that, as in the case of crude oil supply, the coal supply response to price changes takes place after a considerable time lag and then is likely to be distributed over many years.

Superimposed on these time lags, however, are others which result from public opposition (principally in the industrial countries) to new energy supply facilities. Such fears may or may not be justified. Indeed, it is not possible to make out a case in general terms: specific instances have to be investigated. Nevertheless, such opposition is a fact of life which must necessarily be taken into account in considering supply responses. Because of the time lags, though we can be confident that the supply curve for coal slopes upwards (as any well-trained economist would expect) the supply which appears on the market at any given time is much more a response to what prices and price expectations were at various periods in the past than to the prices then current. For example, the El Cerrejon mines in Colombia which are now placing increasing quantities of coal on the world market were planned at a time when prices were

expected to be much higher than they have turned out to be.

These long time lags imply low short run elasticities of supply with respect to price. To illustrate, consider the present situation. As explained earlier producers with heavy sunk costs (like Exxon and its partners in Colombia) will continue in production so long as they can meet their avoidable costs. Thus supply reacts little in the short term during periods of 'surplus' and falling prices price declines are therefore accentuated. Nevertheless, because of a dearth of new investment, eventually there is likely to be a substantial reduction in supply and a significant increase in prices. Similarly, because of the short run inelasticity of supply, unanticipated shortages cannot quickly be matched by expanded output and so prices may rise sharply at such times until eventually increased investment brings greater supplies and lower prices. Because of the short run inelasticity of demand with respect to price, increases or decreases in price have little short term impact on demand consequently, surpluses and shortages persist for some years.

Unexpected market changes, leading to surplus or shortage, are of course a characteristic feature of industries where both supply and demand time lags are long. Participants in the market find it extremely hard to make useful forecasts because both supply and demand are always reacting in complex ways to events in the relatively distant past. Frequently, therefore, such markets overshoot, swinging from apparent surplus to apparent scarcity and back again. The surplus induces what turns out to be 'under-investment' and the shortage induces 'over-investment' so the common state is disequilibrium in the sense that the market is trying to move away from where it is.

9. THE COAL MARKET IN DISEQUILIBRIUM

My own belief is that nearly all markets are nearly always in disequilibrium. That does not mean that the concept of equilibrium which economists use in elementary work is useless. It is a useful expository tool. It is helpful also in the sense that we would not be able to recognise disequilibrium unless we could contrast it with the equilibrium state!

So it is hardly surprising that coal, like most energy markets, is in disequilibrium at present. But how long will it last? Or, more accurately, how long will it be before the disequilibrium of surplus is replaced by the disequilibrium of scarcity? That is similar to the question observers of the crude oil market are asking. In each case, the answer is both simple and complex. The simple answer is to say that the coal market will overshoot in the scarcity direction once coal price expectations have changed. The complexity comes because we do not understand what determines coal price expectations, any more than we understand the formation of oil price expectations.

The typical consultant who examines the world coal market at present, like those who contemplate the oil market, will produce estimates of likely coal consumption and likely supply. He or she will tell you that coal consumption, especially in power generation, will steadily increase and that world trade in coal will rise, maybe at 3-5 per cent a year up to the end of the century. On the supply side, there will be few entrants to the market - that is, few new deposits will be developed at existing prices - but exit from the industry will also be slow, despite the mine closures taking place in Australia, Britain and other countries. The likely prospect, according to this kind of analysis, is a gradual erosion of the present surplus capacity in coal so that some time in the mid-1990s (plus or minus a couple of years) the price of coal in world trade begins to increase. There is a striking similarity between this view and the present consensus about the world oil market.

There are numerous problems in trying to draw helpful conclusions from such supply-demand forecasts. The most obvious is the huge margin for error when one is, in effect, trying to examine small differences between very large numbers. Let us pick out two imponderables from opposite ends of the political spectrum. First, and talking of very large numbers, there is enormous potential for error in attempts to assess Chinese coal exports. Chinese production and consumption of coal are over 800 million tonnes a year, whereas exports have recently increased to around 10 million tonnes a year. Both production and consumption are rising fast, so estimating what will be 'left over' for export involves some heroic, even if informed guesswork. In any case, Chinese exports are not a mere residual. They are a matter for political decision. To take the second imponderable and continuing the theme of political decisions, what if Mrs. Thatcher decides to privatize the British coal industry or, at least, to liberalise coal imports for power generation? If the CEGB were to try to buy another 10 or 20 million tonnes of steam coal a year in a world market where only about 150 million tonnes year is traded, there would certainly be an impact on prices. One can multiply such examples of political and economic uncertainties many times to demonstrate how wide the error margins are around any estimates of prices in the 1990s.

A less obvious but perhaps more important point, is whether such arithmetical approaches to energy markets are capable of capturing real-world market processes. All recent experience shows that expectations are the primary influences on energy markets. Consequently, supply and demand forecasts are not very useful in themselves, though if used thoughtfully they can be of help, as guides to changes in expectations. Prices, for example, do not respond smoothly to observed trends in consumption and supply. They are very largely a function of what people expect to happen and because of the inelasticities of supply and demand with respect to price they typically change quite sharply once expectations alter. Thus an expectation of scarcity, whatever the existing supply and demand balance happens to be, will drive up prices because consumers have an incentive to bring forward purchases and suppliers have an incentive to hold back supplies.

Similarly, anticipated surplus will make consumers hold back and induce suppliers to produce sooner rather than later. Consequently, expectations are, for a time, self-fulfilling.

However, expectations eventually do change[7]. Once a surplus, like that now existing in the coal market, has persisted for some years, there has been little new investment and demand growth has eroded some of the margin of surplus capacity, both consumers and producers begin to change their behaviour as they foresee a period of shortage at existing prices. Prices therefore rise. But this change in behaviour is not necessarily closely related to the time when a supply-demand 'crossover' appears. More likely, it will happen well <u>before</u> the crossover point. That is because market participants are not just carrying out paper exercises in forecasting supply and demand balances. They have an interest in taking action in advance of events which they anticipate since, if they can do so, they should gain a competitive advantage.

The tentative conclusion one might draw about the price of internationally traded coal is as follows: if it is true that the turn in coal prices will come when price <u>expectations</u> change, rather than when demand actually overtakes supply, it may be that producers' present gloom about the price of traded coal is overdone. Admittedly, the immediate prospects are not good and steam coal prices may yet fall a little further. But in the world coal market, and probably in the oil market too, the next upturn in prices is likely to occur well before the margin of excess capacity disappears. It goes without saying that, given all the uncertainties, it is very difficult to know when coal market participants will perceive that the period of 'surplus' is coming to an end so that their behaviour changes in ways which cause prices to rise. But it could be as soon as the early 1990s, which after all will be ten years after the peak of the market. Since the world coal market is now so competitive, an early return to the coal price levels of the early 1980s (over $60 per tonne cif in Western Europe) does not seem likely unless crude oil prices also increase substantially. Nevertheless, it would not be surprising if within five years or so the price of world traded coal is significantly higher than it is now. Perhaps indeed, sometime in the 1990s, there will be a scarcity-type disequilibrium in the world coal market with prices much higher than now and capacity short relative to demand. That prospect may appear too good to be true to hard-pressed steam coal producers. But those who survive the next few years may find themselves in an environment much more to their liking, if one which is not so good for consumers.

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TABLE 1

WORLD PRIMARY ENERGY CONSUMPTION

	1960		1973		1986		AVERAGE ANNUAL COMPOUND RATES OF INCREASE %	
	mtoe	% OF TOTAL	mtoe	% OF TOTAL	mtoe	% OF TOTAL	1960-73	1973-86
OIL	1065	33.8	2798	47.3	2881	38.0	7.7	0.2
SOLID FUELS	1468*	46.7	1668	28.2	2309	30.4	1.0	2.5
NATURAL GAS	434	13.8	1066	18.1	1507	19.9	7.2	2.7
NUCLEAR	1	-	49	0.8	373	4.9	34.9	16.9
HYDRO	181	5.7	332	5.6	519	6.8	4.8	3.5
TOTAL	3149	100.0	5913	100.0	7589	100.0	5.0	1.9

* partly estimated

SOURCES: Derived from BP Statistical Reviews of the World Oil Industry (Annual) and BP Statistical Review of World Energy, June 1987, and Gilbert Jenkins, Oil Economists' Handbook, Applied Science Publishers

TABLE 2

WORLD COAL* CONSUMPTION

ranked by absolute change, 1973-86

million tonnes oil equivalent

	1973	1986	1973-86 change
China	292	531	+239
United States	335	437	+102
Centrally Planned Economies (ex USSR)	262	328	+66
Soviet Union	315	376	+61
S Asia	55	112	+57
Africa	39	66	+27
S E Asia	13	39	+26
Canada	15	35	+20
Australasia	23	41	+18
Japan	54	70	+16
Latin America	12	22	+10
Middle East	-	2	+2
W Europe	253	250	-3
TOTAL	1668	2309	+641

* bituminous coal, anthracite, lignite/brown coal

Derived from: BP Statistical Reviews of World Energy, June 1984 and June 1987

TABLE 3

WORLD COAL PRODUCTION, 1986

ranked by size of hard coal production

million tonnes

	Hard Coal	Lignite and Brown Coal
China	825	65
United States	750	57
Soviet Union	591	160
Poland	192	67
South Africa	177	-
India	155	8
Australia	152	37
United Kingdom	108	-
W Germany	87	114
Canada	31	27
Czechoslavakia	28	97
E Germany	-	306
Others	187	282
TOTAL	3283	1220

Source: BP Statistical Review of World Energy, June 1987

TABLE 4

WORLD HARD COAL TRADE, 1986

million tonnes

EXPORTS

Australia	92
United States	78
South Africa	44
Poland	35
Canada	27
USSR	25
China	10
W Germany	7
Colombia	6
Others	12
TOTAL	336

IMPORTS

W Europe	125
Japan	92
Other Asia	45
USSR and E Europe	39
N America	15
Latin America	12
Others	8
	336

Source: The Coal Situation, Chase Manhattan Bank, March 1987

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