THE COAL SUPPLY FACTOR
IS IT LARGELY ROMANCE OR A SOLID PLUS?

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SYNOPSIS

Achieving even a measure of energy independence requires the maximum use of America's abundant coal resources. A major problem is bringing together the coal reserves in the ground with the utility combustion or synfuel processing plants which will use it. Will the coal move to the plant, or the plant to the coal? The answer to this hinges on transportation economics as well as political issues such as environmental protection, water conservation, and regulatory procedures. In general, coal will tend to move to the utility plants, but synfuel operations will be sited in relation to the coal.

A further problem is establishing sound commercial arrangements for the extraction and transfer of the coal which will provide the investment climate needed to raise the large capital investments needed. Such arrangements are feasible and do not present an impediment to development.

Adequate coal supply therefore is an established fact and not a myth.

The Coal Supply Factor

This paper addresses the problem of how America's abundant coal resources can be used effectively and acceptably in reducing our dependence on foreign energy supplies. In particular it examines the supply/transportation/contracting problems in supplying synfuel plants and electric generating utilities with the large coal tonnages they will require over the life of their operation.

It is generally accepted, and can be readily proven --

a. That coal exists in the quantity needed to provide a secure raw material energy base for at least the next 100 years.

b. That it can be extracted in an ecologically acceptable manner, at a reasonable price which is competitive with other energy sources.

c. That it is impossible to burn or process the coal to produce the energy needed without endangering the environment.

The problem essentially is the bringing together of the coal and the consumption facilities, in an economic and environmentally acceptable manner.

Most of America's coal lies far from its markets. The majority of our undeveloped coal reserves are held by the sparsely populated states, while the energy is needed in the distant, populous ones. The coal and its markets are separated by geography and politics. Long distances separate the coal from its markets and also from the raw materials needed for coal processing, such as water, plant, labor, and management. The coal must either be transported to its markets, or the means of processing it into a more convenient form must be brought to it.

Politically we still must find the means of coordinating regional aspirations with national needs, and we must liberate our coal resources from politically imposed leasing policies and other restraints which discourage investment.

Geography and logistics are the most important factors in determining coal's marketability, whereas with oil these factors are far less important. There are many differences between oil and coal but the most important is transportation. Oil, wherever found, can reach its markets with transportation costs being only a few percentage points of its delivered price; this is the essential benefit of liquid transportation, which is the cheapest long-distance method of moving any commodity. Coal, however, is a dirty, awkward commodity that moves in the most expensive and least developed form--as a solid bulk; transportation costs can be as high as 50 to 75% of its delivered price.

Our coal is abundant, but this abundance is relative. Large reserves of coal thousands of miles from the markets to be served, and connected only by an increasingly expensive transportation system, is not real abundance, nor is it abundance when those very reserves are in a large part controlled by government bodies pursuing policies which discourage investment.

Of the two problems--transportation and politics--transportation is the more difficult, and solutions here would do much to reduce political issues.

In meeting our energy needs, coal will be used in two principal ways:

a. In the generation of electricity, and

b. In the production of synfuels.

(Industrial use, coke for steel making, or coal used for producing chemical feedstocks, and such other applications, represent a very small percentage of coal consumption and can be disregarded.)

The two principal coal users therefore, are electric utilities and synfuel producers. Each shares fairly equally the problems inherent in using coal. To obtain operational efficiency both require large expensive plants, and this in turn requires long-term secure supplies of coal. The financial investment needed is equally massive, and to support it, markets must be identified and assured for at least the life of the investment, at prices which will provide an acceptable return.

In terms of the supply needed, both types of plants are voracious consumers:

a. A reasonably sized generating plant, say of 1000 MW, will consume about 2 1/2 million tons of a good quality coal per year; if the coal is of a poor quality, this figure could increase 50%. Over its 30 year life, therefore, a utility plant of this size requires dedicated coal sources capable of producing 75 to 125 million tons of coal.

b. Synfuel plants to achieve optimum operational efficiency will have to be even larger. The average large synfuel plant will be of 250 billion Btu per/day output, and assuming a reasonable efficiency factor, such a plant would consume about 7 million tons a year of 12,000 Btu coal, or close to 210 million tons for its 30 year plant life.

How the coal will be provided, and the commercial relationships which must be formed to create a favorable investment climate, can be considered by answering five questions. These are:

Question One: How and where do we find sufficient uncommitted reserves at a plant site which can be practical from the perspectives of adequate water supply, environmental restrictions, infrastructure, support capability, and the cost of product transportation?

Question Two: How do we contract with the coal owner for supplies over the 30-year life of a plant, and is such a contract possible from the owner who is seeking to get the best return from his coal?

Question Three: How do we arrive at a price formula which is workable and fair to both parties, while being acceptable to the government and the financial community supporting the project?

Question Four: How do we forecast the price of the coal during the critical five to seven years of construction? (Once the plant is in operation presumably increases in coal costs can be passed through.)

Question Five: How can we be assured that the quality of coal will be consistent with the design of the plant throughout the life of the mining operation?

Question One concerns itself with the relationship of coal reserves to plant siting. This question basically is--do we take the coal to the plant, or do we take the plant to the coal. In considering this question, utilities and synfuel plants must be treated separately.

First, the utility case. When both the coal and its transportation were cheap, but the long-line transmission of electricity was expensive and the environment was not an issue, it made sense to site the coal-fired generating facilities in relation to the market. Later, when oil and gas became the prime utility fuels, the ease of transportation of these fuels determined that new plant locations should also be market related.

Early planning on the conversion to coal perpetuated this philosophy despite improvements in the economics of long-line electric power transmission. New plant sites were established within the utility's transmission grid and its management overview. It certainly seemed easier to bring the coal to the plant, even though distances were intimidatingly great. Two things caused utilities to reconsider this policy, however:

a. Rapidly increasing transportation cost, particularly that of rail, and

b. Increasing environmental pressure against urban coal-fired plants.

This led utilities to consider mine-mouth plants. Where the coal and its market exist within a single state or region this is acceptable, but when this policy is more broadly applied, political and ecological resistance develops. The producing states have no desire to become the boiler rooms for large urban centers in the Midwest and Southern California. Producing states, especially in the West, want the coal transported to the urban areas and burned there. The coal-rich states have no desire to burn their coal locally, and thereby create pollution simply to meet the electricity demand elsewhere. It would appear therefore that coal will generally continue to move to the utilities, with the higher costs being passed through to the consumer.

Two things might change this situation. The first is where coal is moved by pipeline. The advantages and disadvantages of this form of moving coal are complex, and the ~~situation is complicated by legislative lobbying by the~~ railways. It is clear however, that in time the public need will dominate, and the pipeline form of transport will be used. The domestic utility industry will be the principal beneficiary. A pipeline permits enormous quantities of coal to be moved economically in an environmentally clean and safe manner. Pipelines, however, must be large to achieve economy, and they must be supported by very large users at the downstream terminal.

The second influence which might change views on plant siting is new combustion technology. When more environmentally acceptable burning processes are developed, such as fluidized bed, or other exotic methods of extracting the energy from coal are feasible, producing states may recognize the obvious advantage of processing their coal at home and selling the energy, rather than merely shipping an untreated raw material.

The impetus to convince producing states of this potential may be an active synfuel program, because with synfuels the opposite to utility practice is likely to hold. While coal may be brought to the utilities, it seems clear that synfuel plants must go to the coal. There are a number of compelling reasons for this difference:

> First- While the utilities are now tending to smaller units, synfuel plants, to be economic, must be large; the transportation problem therefore is exacerbated.
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> Second- Synfuel plants will achieve greater economy utilizing the cheaper coals containing high moisture or sulphur levels, and those coals which have an ash chemistry which is undesirable for utility use. These inferior coals are very expensive to ship on a delivered BTU price basis.
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> Third- It will be easier to move the other raw materials such as water, technical management, labor, and so on to the coal. These raw materials can be transported more economically than coal.
>
> Fourth- The end-product of a synfuel plant,

whether it is as a gas or a liquid, has infinitely better transportation economics than raw bulk coal.

~~Once again an exception to this siting policy would~~ be the existence of a major coal pipeline. The economics of liquid transportation could quite easily make it attractive to bring the coal to the plant. A further advantage of pipelines is the fact that both utility and synfuel plants are large consumers of water; therefore disposal of the transportation medium will be no problem.

Question Two concerns itself with the contractual terms for securing long-term assured suppliers of coal, while Question Three addresses pricing formulae. These two questions may be linked but before addressing them directly it would be useful to cover a few basic points on coal pricing and contracting.

First a consideration of how coal is priced. Some try to link the price of coal with that of oil. They establish a relationship at some point based on BTU content; then they discount the price of coal to cater for its higher operating costs, and they then extrapolate this price relationship forward to produce an oil-directed coal price forecast. The rationale for this approach is that both fuels represent BTUs delivered.

This approach is overly simplistic and wholly misleading. These two fuels are entirely different. Oil and coal are extracted, moved, and consumed quite differently, for different purposes, and most important, in noninterchangeable facilities; they are not direct substitutes for each other. There is no closer relationship between oil and coal than there is between oil and uranium. Oil and coal are two separate fuels each with its own market structure, each individually subject to different price mechanisms. The price of oil will be what OPEC says it will be using political criteria. The price of coal will be based completely on the conventional laws of supply and demand, and for at least the next 20 years coal will be in adequate supply.

There is, of course, an indirect connection between oil and coal prices. As the price of oil rises, oil becomes less attractive and consumers are encouraged to convert to coal. This in turn increases coal demand which calls for further investment in coal production which generally increases the price. The rising oil price did not drive up the coal price directly, rather the increased use of coal did. The change in the coal price however was not based on the oil price, but on the local supply/demand balance in coal producing and consuming regions.

Coal prices therefore have an economic not a political base. Price levels are based on the cost of new production, and this cost can be planned with reasonable accuracy; therefore price projections can be made with a reasonable degree of confidence.

All long-term coal contracts now provide for periodic price adjustments, normally annually. Contracts contain gross inequity clauses, reopener provisions, escalation formulae, and cancellation clauses, which in effect mean that a long-term contract is merely an agreement to do business over a stipulated period in a series of one year contracts. Price is, of course, the key element in these periodic renegotiations. Price is fixed in one of two ways:

a. By guaranteeing the producer an agreed rate-of-return, or

b. By following market price.

The rate-of-return method sets a base price which provides an acceptable return to the producer, and then adjusts this price periodically to provide for inflation, labor cost increases, and other variables, all the time protecting the producer's profit return. The market price system is based on what the market will bear. It gives the producer no security in a competitive bad market, but neither does it limit his profits in a good market. Both these methods are freely used in the US depending on the companies and circumstance concerned. Large projects requiring financing secured by the coal contract tend to follow the rate-of-return method. Many large coal companies however, are capable of generating investment capital independent of a contract, and these companies tend to favor the market price system.

Coal contracts therefore are no longer long-term legally binding arrangements which tie buyer and seller irrevocably to an inflexible quantity/quality/price agreement. they are now agreements between a willing buyer and willing seller, the life of which depends on obvious and to a reasonable extent predictable commercial factors. As outside influences change production costs or productivity, then the coal operator's price will rise and fall accordingly. The coal user, therefore, must base his operations and financing on a variable cost of fuel.

Now applying this to our problems of siting, we can see that unless the coal source is completely captive, the coal user would be wise to site his plant in an area where alternative coal sources exist, or could be developed, or which could be served by a pipeline, so that some form of competition is ever present.

The easy answer would appear to be that a synfuel plant should remove all uncertainties concerning the supply of raw material and base its operation on a captive source. This may be the best course, and indeed it would be the most sensible course in areas where active competition is not present. Historically however, captive coal sources do not produce cheap fuel. Also, adding coal production to an already heavily committed synfuel management structure increases the problems of an already complex commercial enterprise and greatly increases the capital costs of getting a synfuel plant into operation. A major disadvantage of a captive source is the fact that where a single operation owns, produces, processes, and sells a resulting product for public use, it becomes extremely vulnerable to political interference. The transfer price of the coal from the captive source to the processing plant becomes a matter for legal and political wrangling, as is happening now in utility operations. This could result in the synfuel program becoming completely regulated, with its economics determined by politically appointed public service commissions.

One solution to the coal supply problem might be to joint venture the coal supply. The coal owner would contribute appropriate reserves in the ground, and receive in return equity in the overall project. He would then be paid a management fee and possibly an incentive royalty for mining the coal.

In considering the problems raised in Questions Two and Three it would appear that the best course would be to site a plant to optimize supply and competition, and then let market forces determine the fuel price and resultant synfuel economics. Drawing supplies from a number of producers, rather than one captive one, would provide added security.

Such an approach would also resolve the problem in Question Four, that of contracting for coal at the initiation of the project but predicting its price at the time the plant comes into operation. If the plant has been sited in a competitive area, where the presence of other producers or the threat of pipeline supplies exists, it is relatively easy to forecast price on the basis of production cost plus return, and base the project economics on that price. Minor adjustments would undoubtedly be needed, but these would normally be within the limits of contingency reserve funding.

The last question concerns coal quality and the means of assuring quality consistent with plant design over the life of the operation. There are two ways of dealing with this problem:

a. One, assuring that sufficient coal of the quality desired does in fact exist. This is essentially a question of geology and will require an extensive and expensive program of drilling and exploration. This is the mine owner's responsibility. The onus is on the mine owners to bring to the contracting negotiation reasonable proof of the existence of the assets they are selling.

b. The second insurance against quality deterioration is a plant design which will accommodate a reasonable spectrum of quality. If this is not possible, then it may be necessary to provide some coal beneficiation and blending facilities at the plant, which would ensure quality control even when alternate coal sources, with varying qualities, must be used.

The foregoing is obviously a very general and simplified approach to a serious problem. It is offered, however, to show that while coal supply involves complexity and uncertainty, solutions can be evolved which will satisfy the commercial interests of all parties. The coal exists in abundance, its owners are ready to deliver it provided they get an adequate return on their investment. Careful plant siting will ensure the supply security provided by having alternative sources. Skillful contracting and renegotiation will ensure operational and commercial stability. Coal supply, as a factor in our overall energy plans, will be adequate to satisfy all demand, both domestic and export, for well into the next century. Coal supply for future energy projects therefore, is not a myth but a solid realizable reality.