

MARKET PLACE ECONOMICS AND COAL CONVERSIONS

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In 1973-74, the year of oil embargo, the price of oil more than doubled from 5.25 to 13.50. The fuel price economics, that we all were accustomed to for more than a decade, suddenly changed. In 1974 Congress passed its first coal conversion law, which proved to be relatively ineffectual. However, industry, especially utilities, started investigating the possibility of converting to coal. Some, a precious few, which had all the equipment from previous years of coal burning, and had the pollution control equipments needed to meet the then existing pollution control requirements, were able to convert back to coal. During the period from 1974 through 1978, about 26 powerplants converted back to coal with a savings of 80 thousands of barrels of oil per day. During this time, the price differential between oil and coal was nearly constant at about \$1.20 per million BTU. Chart 1 shows the trends in residual oil, gas and coal prices over the last several years. The price figures are average delivered prices to powerplants.

In 1978 the New England Power Company recognized that a conversion order gave them special provisions under the Clean Air Act, and their Brayton Point Generating Station was the first to apply for and receive a Delayed Compliance Order from EPA. This permitted this 1,125 megawatt generating station to commence burning coal in December 1979, using their existing equipment. In 1980 and early 1981, they installed the pollution control equipment that was needed to meet the state requirements, and in March and June, 1981, Units #1 and 2 completed the conversion and are fully on coal and in full compliance with all state and federal laws.

The winter of 1978-79 was the period of the first of the Iranian oil crises, and the price of oil which had remained relatively stable and constant in real terms since 1974 suddenly escalated and oil was in short supply. In addition to coal conversions, two significant programs or actions were put into full implementation during that period. First, the utilities made a concerted and conscientious coordinated effort to wheel power. This so-called coal by wire program shipped electricity generated from lower price coal to regions of the country that were pre-

dominately oil. This on going activity, we estimate, has saved about 350,000 barrels a day of oil since the beginning of 1978. The other program was to issue public interest exemptions to utilities to remove a regulatory impediment to increase gas use.

~~Based on the reports from utilities, these exemptions saved on~~ the average 400,000 barrels of oil a day during 1980. The higher price of oil heightened the interest of the utilities and industry in coal conversion. The price differential between oil and coal doubled in 1979 to \$2.45 per MMBTU by the end of 1979. Other utilities, namely VEPCO and Atlantic City Electric, followed the example of the milestone conversion at Brayton Point and applied for Delayed Compliance Orders. They are now burning coal while the conversion and the installation of necessary pollution control equipments is still going on. These conversions to Delayed Compliance Orders are currently saving about 40,000 barrels a day of oil. Thus, by the end of 1979 utilities reduced their oil consumption by about 800,000 bbls./day and nearly half of this savings came from coal-fired generation.

The Iranian-Iraq conflict resulted in still further changes in the oil price situation. The prices of crude oil jumped again in the beginning of 1980. However, the price of resid exhibited a distinctly different pattern in early 1980. Note the dip in oil price on the chart. Although the cost of crude increased significantly, the price of residual fuel oil, especially for high sulfur resid, decreased during the first quarter of 1980. This phenomenon surely must have been a confusing signal to industrial fuel users. However, that phenomenon, as well as the subsequent price rise, results from market forces at work in the world economy. The price rises in 1979 were sufficiently great to result in a major amount of fuel switching. As previously mentioned, utilities alone saved approximately 800,000 barrels a day of oil. Further industrial conservation programs and reduced economic activity, all contributed for lower demands for residual fuel oils. In short, we had an oversupply of resid, and the prices dropped to clear the market. Subsequently, the residual supply demand balance has been restored. On the supply side, refiners (worldwide) have recognized for several years that resid and heavy crude oils command lower prices than light crudes and lighter finished products. On a worldwide basis over the last several years, major investments have been and are being made in refinery upgrading that will reduce the fraction of the barrel that is produced as residual fuel oil. Further, since oil decontrol, most sophisticated refineries which produce less resid have been running at higher rates than the less efficient refineries. Resid production has decreased and the supply/price demand balance has been restored. From last summer to this spring resid oil price had gone up and the price (\$5.89/MMBTU) was quadruple the price of coal. However, for those who want to

only see the brighter side of things, the resid market is softening and last week's posted price for high sulfur resid in New York Harbor was down to \$30.00 per barrel or (\$4.84 MMBTU).

Future Coal Conversions

With a fairly high degree of accuracy, we can predict the utility powerplants that will convert from oil to coal in a conventional manner over the next six years. This degree of confidence has changed as dramatically as the prices in the last year, whereas a year ago the domain was limited to plants designed for coal and likelihood of conversion was a judgment of what various parties perceived the future prices of oil and coal to be. These price rises have made believers of the skeptics, the companies, the PUCs and the ratepayers. We estimate that more than 30 generating stations, predominately located in the East from Virginia northward will convert to coal, and that these 16,000 megawatts of capacity, when converted, will save about 325,000 of barrels per day. In an example, as ConEd's Ravenswood Plant, this 928 megawatts will save over \$600,000 a day when converted to coal. It is expected that three-fourths of the plants that once burned coal or were designed to burn coal will convert. The remainder are too old or the pollution controls too extensive to warrant the investment.

However, those plants do not represent the full potential for coal conversion. The full potential for conversion, using pulverized coal is much larger than even the most optimistic coal conversion advocate ever thought about: Last year 1.1 MMBD oil and 1.62 MMBD gas was used in powerplants. One must now consider that all base load oil and gas steam electric plants as potential conversion candidates. This is a ramification of the ongoing conversion of the Irvington Power Station in Tucson, Arizona. These four boilers were designed for oil and gas only and have only ever used oil and natural gas. Tucson Electric Power Company is engaged in a project today that will convert these four powerplants to pulverized coal. Yes, these boilers have all the characteristics of a gas-fired boiler--closed tube spacing, small fire box, no coal handling or pollution control equipment, shallow sloped boiler bottom, only a few feet clearance under the boiler and no soot blowers. The conversion does entail a derating. Depending upon their design, the derating may be as much as 50 percent when burning coal. However, the rating is not of importance in the wintertime when the demands are down. Further, the full capacity will be regained in the summer peaking period by reverting back to oil or natural gas. The conversion of this plant is technically and environmentally feasible and is cost effective. Conversion of the first boiler at the North Irvington Plant will be completed in 1986. The potential for this type of conversion is enormous. I

most explicitly point out that this conversion is only economic because scrubbers are not required and this will generally be true elsewhere too. No one has made an attempt to estimate the full potential oil savings from this type of conversion. However, a number of utilities are following these developments closely and already conversion candidates of non-coal capable plants have been named that could save 350 MBD. One must surely speculate how much of that 2.7 million of barrels of oil and gas a day currently being burned to produce electricity would be saved by conversions such as are going on at the Irvington Station.

Impediments to Conversion

When you look at the fuel price economics, one must ask the questions: why didn't they convert earlier; and why don't they convert faster? Those are fair questions, but the answers are very difficult. There are some obvious answers which you all know--licensing, permitting, environmental requirements, objections from organized groups and funding and capital requirements. The latter requires some further clarification, especially to those from manufacturing industry who think in terms of free market and profit and loss statements. There are two segments of our economy which have a different perspective on economics. First, there is Government, all levels of government from the local school board to the Federal Government. This is a part of our economy in which the administrative branch operates on funds appropriated by the legislative branch for specific purposes. For example, a coal conversion is funded out of the construction appropriation; the operating personnel are funded out of a second budget appropriation; the fuel savings are a third appropriation. The decisionmaker for the capital improvements must balance the funding requirements for boiler conversion with that for construction of other projects such as hospitals or roads. Fuel and operating costs are not normally part of his purview.

The utilities represent still another problem. Coal conversion capital must be provided by the investor. Fuel savings pass directly to the rate customers through the fuel adjustment clauses. The Public Utility Commission, which consists of elected or appointed officials, must approve rate increases in order for the investor to recover his investment. Rate increases are very unpopular with electric customers who are also voters that elect PUC members. In other words, there generally is no direct link between the fuel savings and return on conversion investment for utilities. However, the fuel cost savings are so attractive, I am very confident the problem can be solved. For example, the conversion of the Irvington Station will require a considerable investment. A public interest rate payers group requested a hearing on the conversion.

After a full disclosure of facts at this hearing, including independent testimony by the Government that the present value savings would be \$130 million, there was no objection to the conversion. Another example is Massachusetts where the fuel cost savings are shared by the utility (investor) and the customers.

One further consideration appears to be an impediment to industrial conversions in the free market. This is the uncertainty of future coal prices and the fear that coal prices will follow or track oil prices. This question has been raised over the last seven years and has been studied both by the Government and by private firms. The result of these studies is the same.

Coal prices at the time will be set by production costs since there is so much coal available and we have extensive competition. However, there are three factors beside coal production costs that may disrupt the free market price. First is transportation costs; especially the railroads who don't really have any real competition. Second is the states who may impose taxes and third is the environmentalists who could require extensive and costly pollution controls. In summary, most authorities believe delivered coal prices will be independent of oil prices. A look at the fuel price chart clearly shows that coal and oil prices have been independent in the past. However, many authorities do foretell a oil-coal price linkage in the future...coal will limit oil and gas prices when we have a robust synthetic fuel industry.

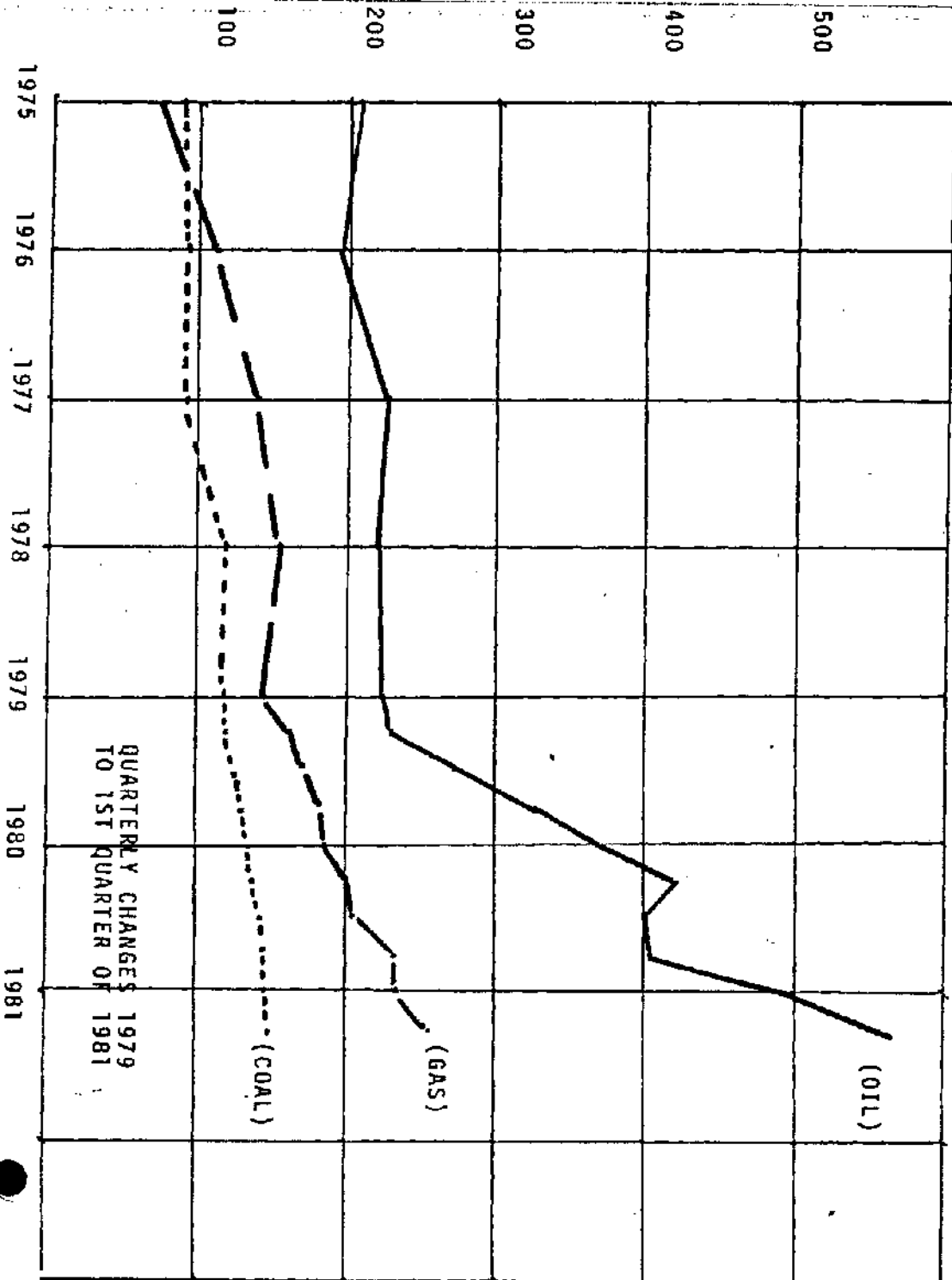
In summary, conventional coal conversion is really getting into high gear. About 300 MBD of coal capable plants are on the road to conversion now. Conversion of oil and gas designed plants, a heretofore inconceivable event, is now possible; plants totaling 350 MBD have already been identified as conversion candidates and many utilities are just exploring this option.

Thus, the likely oil savings figure is already 750 MBD (or 5.4 billion dollars a year fuel cost saving) and is expected to increase.

AVERAGE FUEL PRICES
CENTS/MILLION BTU

AVERAGE YEARLY PRICES OF FOSSIL
FUELS DELIVERED TO STEAM ELECTRIC PLANTS
25 MW OR MORE

SOURCE: FERC 423 REPORT: "THE COST AND QUALITY OF FUELS FOR ELECTRIC UTILITY PLANTS"



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