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PROSPECTS FOR COAL SLURRY PIPELINES IN CALIFORNIA

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I. INTRODUCTION

An important new segment of the transport industry is emerging in the United States. It is accepted it will play a vital role in meeting America's urgent energy requirements without public subsidy, tax relief, or federal grants.

It is a proven technology, ideally suited to transport of an abundant energy resource over thousands of miles to energy-short industrial centers and at more than competitive costs.

It is an "idea whose time has come," the coal slurry pipeline, a coal delivery system designed to link plentiful western coal reserves with electric power plants in the Midwest, Midsouth, Southwest and Far West regions, much as oil and gas are now moved by the 500,000 mile network in this country.

While relatively new to the general public, the slurry pipeline concept has been an important part of the world's commodity transportation picture for many years. In fact, the first U.S. coal slurry patent was granted in 1891 to Wallace C. Andrews, who had exhibited a working model of his slurry pipeline system at the Columbia World's Fair in Chicago in 1890 and constructed a pilot plant in New York City.

The first practical application to contemporary transportation requirements came in 1957 when the Ohio Coal Pipeline began operations. This system ran successfully for six years. Its economical operation had served to force down rail rates for coal deliveries from that part of the country.

Other slurry pipelines around the world in over 14 different locations have proven to be a most economical method for transporting other important raw materials such as copper, magnetite and nickel ore. One such pipeline has been operating since 1972 in California's Gold Country, pumping limestone slurry 17.6 miles from Flintkote Company's Cataract quarry to its Calaveras Cement Division plant at San Andreas.

Completely hidden from view, the Calaveras pipeline transports the slurry silently, safely, and reliably while preserving the beauty of its Mother Lode setting and eliminating the need for large numbers of trucks to haul the limestone.

Consumers in Southern California also benefit from the best example of coal transport efficiency in the United States. The Black Mesa pipeline, which is the world's longest coal slurry pipeline system in operation carries five million tons of coal a year from northeast Arizona to the Mohave power plant in southern Nevada, a distance of 273 miles over rough and mountainous terrain.

Operated for Southern California Edison, this pipeline has been in continuous use since 1970.

This system's track record has been excellent. Jack K. Horton, Chairman of the Board of Southern California Edison, has stated, "... our experience to date indicates that the Black Mesa pipeline has transported coal to the Mohave Plant at a cost benefit of nearly 50 percent below that of alternative transportation costs."

He also pointed out that from the time the pipeline began commercial operation on November 1, 1970, it has demonstrated a reliability factor of better than 99 percent.

Simplicity is the coal slurry pipeline's chief asset. The 2" x 0' coal is received from the mine, cleaned, crushed and then mixed with water to be pipelined to its destination. In all respects the pipeline construction itself is conventional, including the pumping stations which use standard off-the-shelf equipment items.

At the discharge end, the coal is dewatered by centrifuge. The water is clarified and used in the cooling tower circuit. The coal is delivered by belt and is utilized in the boiler, much as rail coal would be.

II. CALIFORNIA MARKET POTENTIAL

In California, as elsewhere in the United States, electric utilities are seeking other fuel sources to replace dwindling reserves of natural gas and high-priced imported oil. Nuclear power, which initially seemed to be such a bright prospect, has dimmed in the face of increasing costs and regulatory delay.

A recent study undertaken by the Office of Technology Assessment (OTA), the research arm of Congress, has forecast that the demand for coal in California will grow from less than

one million tons per year in 1980 to 39 million tons annually in the year 2000. Much of this coal is expected to come from distant reserves in Utah and Wyoming, traversing mountain and deserts to reach urban and industrial centers.

The study also looked at several movements of coal to markets throughout the Western states and reached some pertinent conclusions including: pipelines are more economical than rail for long-distance, large-quantity hauls; for other situations, pipelines are competitive on a case-by-case basis.

In citing a hypothetical case wherein slurry and rail coal transportation were directly compared on a routing between Wyoming and Texas the OTA found in this long-distance, large-quantity (35 million tons a year) example that slurry was definitely the better way on several counts.

The study reported that the most direct railroad routing possible in this sample case--from Gillette, Wyoming to Houston--would be 1,584 miles, compared to only 1,170 miles for a slurry pipeline to connect the two points. Covering that additional 400 plus miles costs money, of course, and the sheer distance advantage the slurry pipeline would have, in addition to the many other cost-effective factors in favor of the pipelines, resulted in a significant bottom-line finding by the OTA.

In this hypothetical case, the OTA study reported that the per-ton cost of moving coal by pipeline over the Wyoming-Texas routing would be $6.50, compared to $9.10 by rail. It is this kind of dramatic cost difference which begins to make economic sense for the shipment of coal by slurry pipeline--in the minds of utilities, industrial users and, most importantly, the ultimate consumer.

In another hypothetical case, the OTA made a comparison from Utah to California and found that an equivalent rail routing would be 30 percent longer than pipeline and would require replacement of 25 percent of the present rail system to meet new operating requirements. However, in this case, which would involve the shipment of only 10 million tons of coal a year over a much shorter distance from Price, Utah to Barstow, California, the per ton shipping cost favored rail, pointing up the fact that pipelines are superior over the long haul involving large quantities. Even with the shorter distance involved in the Utah-California case (684 miles by rail, 522 miles by pipeline) we are confident that the economics would have favored pipeline if the amount of coal to be shipped was significantly larger.

III. SLURRY TECHNOLOGY - NEW EFFICIENCIES

By way of background, the electric utility industry from 1925 to 1970 maintained a remarkable stability in its rates brought about by efficiency of power generation. In fact, the electricity rates for residential consumers actually decreased 70 percent during this period, while the Consumer Price Index rose 500 percent.

By building ever larger and more efficient power plants, less fuel was needed to produce a given quantity of electricity. Enormous gains in the size of the boiler units kept the cost of kilowatt hours extremely stable over a long period of time.

In the 1970's, however, generators began reaching practical size limits and formerly predictable fuel costs began soaring. Western coal reserves have emerged as an abundant and relatively inexpensive energy source which can once again restore stability to the cost of kilowatt hours.

The key to economical use of Western coal lies in transportation costs which will run as high as 70 percent of the delivered cost of fuel. For this reason, coal slurry pipelines offer the technological breakthrough in economies of scale necesary to transport coal over long distances while maintaining reasonable electric rates.

In the Far West, with substantial distances between coal reserves and the end-user, the economies of scale gain added significance. As proven time and time again, the larger the system, the more competitive the pipeline over rail transport. This conclusion has been confirmed by the previously mentioned OTA study.

In contrast there is practically no economy of scale for the railroads which will carry the burden of most coal transport. A unit train set of 110 cars at 100 tons per car will move 11,000 tons per trip. If a trip takes five days one way for a 1,000-mile movement, then by definition one train set would move about 400,000 tons per year. Additional tonnage above this level merely calls for additional train sets.

Pipelines in general enjoy a much lower inflation sensitivity than rail transport because 70 percent of its costs are fixed. Once the pipeline is installed, only 30 percent of operating expenses are subject to increases in the cost of labor, electric power and supplies.

In the case of rail, the reverse is true. Between 75 and 80 percent of its costs are variable with inflation. For instance, more than half of rail expenses are tied to the cost of labor and are consequently subject to the volatile impact of labor disputes and strikes, not to mention

higher operating and maintenance expenses.

Pipelines use about one-eighth the labor, 40 percent less steel over a 30 year period and, for items such as supplies, two to three times less the dollar amount per ton of coal moved.

Production in the Western coal reserves is forecast to jump by at least 300 percent between now and 1990. The OTA study estimates that by 1985, the railroads will need to acquire 9,100 locomotives, 197,000 new coal cars and 350,000 other freight cars to meet expanded coal delivery requirements.

Additional expenditures to upgrade badly-deteriorated rails, roadbeds and grade crossings--for which the railroads are seeking substantial government subsidies--clearly make it impossible for the railroads to handle such a massive undertaking on an economic basis.

In the western states, coal slurry pipelines are expected to carry about 25 percent of total coal traffic by the turn of the century, thereby providing an urgently needed and economical supplement to rail transport.

IV. ENVIRONMENTAL BENEFITS

Environmental considerations present another powerful argument in favor of coal slurry pipelines in such states as California which are fighting to preserve the inherent beauty of the land. The slurry system is underground, it is silent and invisible, and it doesn't disturb nature or interfere with the lives of people in the region where it operates. Pipeline construction is brief and the land is restored to productive use.

These positive factors are weighed against the unpleasant side effects of steady coal train traffic through communities. For example, the Burlington Northern has estimated that by 1980 it will be operating 84 coal trains a day, including returning empties, over the four routes out of the Powder River Basin in Wyoming. If evenly divided among the four routes, this adds up to mile long unit trains moving along the rails at one-hour intervals, day and night, constantly interrupting the flow of automobile and pedestrian traffic and interfering with emergency services across the tracks which bisect many Western communities. The noise, vibration, the dust, and smoke will also have their impact.

V. HEALTHY COMPETITION

When all pros and cons of the coal slurry pipeline are taken into consideration, the introduction of healthy competition might well be the system's chief contribution to the Western states. Lacking even barge competition, Western carriers have been able to charge just about what they choose to transport coal. As slurry pipelines are built, railroad management will have to consider competitive forces in setting their rates, just as in other parts of the country.

In recent years, utilities have been experiencing difficulties with the railroads during tariff negotiations. For instance, several utilities have lawsuits against the Burlington Northern necessitated by the "take it or leave it" attitude engaged by that railroad in setting tariffs. A utility executive, in a sworn statement before the ICC, summed up his frustration with BN's "arbitrary increases above and beyond escalation," by saying, "Certainly, it is not inflation. Unreasonable exploitation of a monopolistic advantage is undoubtedly a more realistic explanation." (ICC Docket No. 36719)

The injection of coal slurry pipelines into this monopoly will provide the head-to-head competition which will force the railroads to adopt a more equitable rate-making posture and result in savings for Western consumers.

One clear perspective on how this might come about was voiced recently by Betty Jo Christian, Vice Chairman of the Interstate Commerce Commission. In a public address she stated:

"It is worth noting that there is one potential pricing restraint of major proportions currently looming over the developing Western coal market. I am speaking, of course, of the proposals for pipelines to carry coal in slurry form from the Western mines to large utility and commercial users."

Ms. Christian continued:

"The existence of a competing form of transportation for Western coal would put the whole subject of railroad rates on coal in an entirely different context... The situation as it exists today (is that) the railroads possess a virtual monopoly over large-scale, long distance coal traffic--and I can only offer the caveat that, if and when slurry pipelines make their appearance, our entire approach to railroad rate-making will have to re-examined."

Ms. Christian has put her finger on one of the key points in the pipeline versus rail debate: From an economic standpoint alone the railroads cannot be allowed to continue their dictatorial stranglehold on the movement of coal in this country.

VI. THE ETSI PIPELINE

Movement of coal from the Western reserves via slurry pipeline will be achieved by Energy Transportation Systems Inc. Plans are well underway for a 1400-mile pipeline from the Powder River Basin coal fields in Wyoming to

utility and industrial customers in the Midsouth region, ultimately terminating on the Mississippi River in Arkansas and Louisiana.

This region, which has been dependent upon natural gas for decades, is experiencing the pressures of disappearing gas reserves and sharply higher prices for imported oil. Plans to convert from oil and natural gas to coal as fuel for electric generating facilities makes coal slurry transport an increasingly attractive alternative, not only for the Midsouth but for California as well.

The ETSI pipeline will be financed entirely with private capital and will require no government financial support. It will ship 25 million tons of coal annually under long-term contracts with customers along the route. A major customer is expected to be Middle South Utilities, which operates an extensive electric generating system in that area. The pipeline also has the flexibility to adapt for deliveries to other utilities and for trans-shipment by barge for deliveries on the lower Mississippi.

Important economic benefits will accrue to consumers along the route. It is estimated that a typical 750 megawatt generating unit can save about $1 to $1.5 billion in transportation costs by using a coal pipeline for 30 years. The ETSI pipeline has the capacity to supply 10 such units, for a potential saving of $10-15 billion.

With the implementation of the ETSI system, coal slurry pipelines will be given a chance to prove their worth in the marketplace. As the benefits of this mode of transportation become more widely recognized, we project that more states will opt to include the coal slurry pipeline in their list of top energy-related priorities, including California.

Certainly the stability of pipeline costs over time will do much to permit stable energy prices, which in turn will allow our manufactured products to be competitive in the world market, and to reduce our dependence on foreign oil which will improve our trade balance and the value of our dollar--at home and overseas. In the long run, the ultimate beneficiaries will be the public and the taxpayer, adding impetus to the widespread acceptance of an idea whose time has come.