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COAL MINING IN ALASKA

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Introduction.

Recently, articles have appeared in the news media which describe the reviving status of the U.S. coal industry. [1] In spite of competition from other fuels, nuclear energy, and hydro power, U.S. coal production is destined to expand. The forces behind this expansion are the increasing need for electrical energy, and exports to foreign lands. Use of other fuels is likewise anticipated to rise in order to meet the increasing electrical needs of an estimated U.S. population of 300 million people in the year 2000. It is anticipated that U.S. coal production will be doubled (900 million tons) by 1980. [2]

The prediction that coal can withstand competition with other energy sources is assured by the increasing efficiency of coal-fired generation facilities, extensive coal reserves, the improving technology of EHV (extra high voltage) transmission lines (thus employing the mine-mouth plant concept) and/or decreasing coal transportation costs. [3]

A consideration of Alaskan coal mining is thus a timely topic due to the growing need for primary energy in the development of the State. It is worthwhile to test the status of the coal industry against the U.S. Average Statistics to see if the industry is on the right track. These statistics reveal some parallelisms and surprising facts.

Reserves.

A review of Alaskan coal reserves is in order. The U.S.G.S. estimates the following:

22 billion tons bituminous coal
70 billion tons lignite and sub-bituminous
3 billion tons anthracite

Total 95 billion tons Alaskan coal, or almost 6% of U.S. reserves of 1.66 trillion tons (which are 1/3 of the world's coal reserves.) [4]

The Alaskan reserves are located as follows:

The largest field is located on the Arctic Slope (450 miles eastward from Point Hope by 100 miles wide) and contains coal ranging from sub-bituminous to coking bituminous grades. Although large reserves are located at tidewater, transportation is a difficult problem. The Bering and Chuckchi Seas are ice-blocked 5 to 6 months of the year, and of course, overland transportation is presently impossible. Nevertheless, at least two major mining companies have been actively exploring the field during the past year.

The only other area known to contain large quantities of coking coal is the Bering River Field of southcentral Alaska. Limited geologic exploration by the U.S.G.S. indicates reserves in excess of three billion tons. Extensive folding and faulting throughout the field has hampered its development and in fact some geologists maintain that the Bering coals will never be mined due to the field's structural complexity. However, since the amount of geologic work done has been small, a reasonable potential for locating mineable coal exists. A very definite asset is the field's tidewater location with year-round ice-free harbors.

Another coal field in which active exploration by major companies has recently taken place is the large Beluga sub-bituminous

field, located west of Cook Inlet. Relatively flat (10 to 15° dip) beds of up to 40 ft. in thickness are known to occur near tidewater. The potential marketing arrangements for this coal have not as yet been made public.

The two known large remaining fields are both producing and are situated in the "Railbelt" area. The Nenana Field is near Fairbanks and the Matanuska Field is near Anchorage.

The Nenana (or Healy River) coal field contains sub-bituminous coal reserves estimated by the U.S.G.S. at five billion tons. The size of the field is 40 by 15 miles. Sizeable production during last year came from one operating mine owned by Usibelli Coal Corp., which produces annually over 600,000 tons. About 70% of this production is consumed by the military complex near Fairbanks. The remaining tonnage is used by electrical utilities and a small domestic market.

The Matanuska Coal Field, in the Matanuska Valley, is estimated by the U.S.G.S. to contain 201 million tons. In continuous operation since 1916, with from one to four active mines, the field presently has three mines producing about 300,000 tons annually. The coal ranks as a high volatile "B" bituminous (non-coking) grade. About 80% of the field's production is shipped to the Anchorage area military defense complex for steam plant use and 15% is shipped to an Anchorage electrical utility. The remainder is consumed by a small domestic market.

Other Alaskan coal regions are the Seward Peninsula, the Upper and Lower Yukon Valley, and the Kuskokwim Valley, southeastern Alaska, Cook Inlet, the Copper River, and southeastern Alaska.[5]

On a state comparison basis, Alaska places sixth in total U.S. coal reserves. This is how U.S. reserves by states lined up as of January 1, 1960:[6]

North Dakota	351	billion tons
Montana	222	" "
Illinois	136	" "
Wyoming	121	" "
West Virginia	104	" "
Alaska	95	" "

With 6% of total U S. coal reserves, Alaska is amply endowed with this energy source, enough to force attention to coal whenever expansion of heat sources through population and industrial growth warrant it. Further, the state of the art of coal mining in Alaska parallels the trends in the U.S.

Mining Methods.

A gradual shift to strip (or open cut) mining away from underground methods has been made in Alaska, and with it an attendant decrease in price of coal. Historically, underground mining has been more costly than strip mining and it usually yields less output per man day than surface mining. (Automatic mining may eventually reverse this, however.) Since 1962, no major underground coal mine operated in Alaska; all coal is mined in open or strip mines, despite extreme weather. Mining appears to be conventional, but is complicated by steeply dipping multiple seams. Overburden and rock is usually removed by shovel and draglines (the largest of which is six cubic yards.) Bench heights vary to suit the equipment used and local variations in techniques of drilling and blasting and dumping are used to suit particular conditions.

The experience of the Alaskan coal miners serves to point out that any open pit mining is indeed possible year-round in Alaska.

We might compare statistics again as we might expect that the number of days worked per year and the price of coal F.O.B. the mine to diverge greatly from U.S. standards. Surprisingly, the average number of days worked per year in Alaskan coal mines was 302 days (1962) as compared with the national average of only 199. The closest to Alaska was Illinois with 232 days. The majority of states were below 200. In fact, over a ten year period, Alaska held the record for number of days worked per year, with the exception of 2 years when Kansas exceeded Alaska. This is a remarkable attainment of continuous productive capability (and utilization of high cost equipment,) and indicates that Alaskan coal miners work many overtime days, despite the rigorous winter. [6,7]

How about production per man-day? Here the Alaskan coal mines tend to parallel U.S. experience. In 1962, the average U.S. coal miner produced 14.7 tons in a day while the Alaskan miner produced 18.5 tons. Since this is a combination of underground and strip production, a more accurate approach is by a comparison of strip mines and underground mines separately. When comparing only underground data, the Alaska mine which did work underground in 1962 exceeded the national average by 8 tons per man-day. [8] A comparison of Alaskan strip mines production to average U.S. strip mines places Alaska behind at 18.4 vs. 26.8 tons per man-day. However, if we delete the few giant shovels and draglines now in use, Alaska strip mines parallel U.S. averages for mines with equipment of the same size range. [9]

Such statistics reveal that union men of the United Mine Workers and Alaskan coal mine management are well in accord in getting the job done. These miners deserve much credit in helping

to maintain coal's competitive position in the Alaskan energy market, despite winter operations.

Prices.

From an entire market's viewpoint there is no universal price for coal, or any other energy source, which can be stated. The economics of transportation, the factors of supply and demand and competition between fuels in a specific location governs market prices. As we might suspect from the record of continuous production in spite of weather mentioned earlier, Alaskan coal would be higher valued than average U.S. coals. In 1962, the Alaska average price was $7.35 a ton F.O.B. mines and the U.S. price was $4.48. Surprisingly, Alaskan coals were below the $7.39 of Alabama. [10] Prices in Alaska are steadily coming down. In 1963 one of Usibelli's large contracts was for $6.30 per ton F.O.B. mine for 8500 BTU/# coal. The current F.O.B. mine (Matanuska Field) price for Evan Jones Coal is $7.90/ton for 12,500 BTU coal. (This coal is processed in a modern heavy-media coal preparation plant and no mine-run product is currently being made.)

The discovery of natural gas on the Kenai Peninsula about 80 miles south of Anchorage in 1958 and the subsequent construction of a pipeline to the city in 1961, has presented a serious competitive threat to the Matanuska Field coal industry. It is fortunate for the coal miners that they were in the process of converting from underground to strip mining methods prior to the discovery of gas. The lower cost of mining strip coal enabled the coal producers to maintain a competitive position.

Large scale stripping began in 1958 and prices have

decreased as follows:

STEAM COAL PRICES F.O.B. JONESVILLE (per ton)

Contract Year	1958	1959	1960	1961	1962	1963
	$12.65	$12.20	$11.45	$9.90	$8.50	$7.90

(During the same period railroad freight charges increased from $2.31 per ton to $2.54 per ton.)

The above prices were paid for coal of the following approximate specifications:

12.5% Ash, 8.5% Moisture, 12,550 BTU per Lb., Dry.

It should be noted that the BTU value of coals must be considered when discussing prices. This is especially true (and is done) when comparing the various mineral fuels as heat energy sources.[11]

Transportation.

A main factor affecting price and which controls the market area of any fuel is, of course, transportation costs. In typical U S. coal marketing, water, rail, and truck methods compete for coal's business. In one case a coal slurry pipeline, conceived as the answer to higher cost rail methods, forced a newer concept upon the railroad. The pipeline was then shut down in favor of the railroad's new "unitized (or shuttle) train" concept - a fast load-haul-dump - and return train made up of coal hopper cars only. (When competition arises it is often amazing how many cost savings can be found.)

In Alaska, coal hauled 110 miles via railroad from the Nenana coal field to Fairbanks markets in large quantities costs $3.42 per ton or 3.2 cents per ton mile. The cost of hauling Evan Jones coal 60 miles to the Anchorage market is 4.2 cents per ton mile.

Under the "unitized train" system in the U.S. coal is hauled for 0.7 to 1.0 cent per ton mile. In terms of shipping cost this is at least a 3½ to 1 handicap on Alaskan operators over a comparable U.S. situation when competing for a distant "railbelt" location market. The only immediate method open for improving the Alaskan coal producer's bid price position is through reducing mining costs and this is, indeed, being done.

Longer range projections are difficult to assess. The economics of pipelining coal in Alaska does not appear to be favorable at this time. Coal-by-wire (distribution of energy via electrical transmission lines) is a compelling development and in the EHV approach a sure aid to both U.S. and Alaska coal producers.

Future.

The most promising immediate markets which U.S. coal producers face are increases in export coal sales and a healthy share of the growing electrical generation fuel requirements.[12] That Alaska coal producers might share in the export increases expected could be a possibility. However, since the marketing arrangements are quite competitive and since no facilities for exporting large tonnages of Alaskan coals exist a potential exporter faces a huge task. (Mostly sought are the coking coals and Alaska's have not been developed. The tonnages traded are substantial, however. Recently a Japanese contract was won by a coal company near the British Columbia - Alberta border. The contract was for 900,000 tons of coking coal at $9.00 per ton F.O.B. Vancouver, B.C.)

Of immediate concern to Alaskan coal producers is the possibility of captive (mine-mouth) electrical generation by coal-fired steam. Long line interties between Alaska's electrical utilities

are being discussed with immediate "mine-mouth" plants for the Nenana and Matanuska Fields. The Matanuska coal field producers are actively supporting the construction of an electrical plant near Sutton, Alaska (in the coal field.) This generating plant would supply power to meet the 11% annual growth projected for the area, which is critically short of power. The coal producers have given firm proposals to deliver coal on long-term basis to the mine-mouth plant at less than 30¢ per million BTU delivered to the plant. I am not at liberty to disclose actual long term proposals since the contract would be bid competitively by the various Matanuska coal producers.

In conclusion it can be stated that coal mining in Alaska is a healthy industry with a long tradition; its future growth can be expected to parallel the anticipated growth in the U.S.

Bibliography & Notes

1. "Business Week," Feb. 1, 1964, Coal Hits a New Vein, pp. 90-93.

2. "Resources for America's Future," written and published by Resources for the Future, Inc., Wash., D.C., 1961.

3. Note: The following is quoted from "Steam-Electric Plant Construction Cost and Annual Production Expenses," 14th Annual Supplement, 1961, by the Federal Power Commission, U. S. Gov't Printing Office, Wash., D.C.

> "Coal, of the three principal fuels, is inherently the more efficient fuel for power production purposes. This is due to its chemical composition. In the combustion process, a good grade of coal properly fired will produce more useful energy than an equivalent amount of fuel oil or gas. This is attributable to the amount of hydrogen contained in gas or oil compared with coal. The hydrogen is converted to water in the combustion process and the latent heat of the water vapor resulting from the burning of this hydrogen is lost in-so-far as useful work is concerned. It is not available for steam production."

The following is quoted from "The Fossil position in Future Power Generation" by James R. Garvey, President, Bituminous Coal Research, Inc., Monroeville, Pa., (An address to the A.S.M.E., Philadelphia, Pa., November 11, 1963.)

> "A fuel cost of 3.33 mills per KWH for a fossil-fuel plant operating at 40 percent efficiency would be equivalent to a delivered fuel price of 39 cents per million BTU. Therefore, the A.E.C. estimates indicate that nuclear plants being built today are competitive only in those areas where the price of fossil-fuels equals or exceeds 39 cents per million BTU. Of the 474 plants representing 96 percent of the total kilowatt-hours produced, listed in the 1961 Federal Power Commission survey, only eleven had fossil-fuel prices in excess of this 39 cents per million BTU."

4. "Coal Reserves of the U.S. - A Progress Report, Jan. 1, 1960.", U.S.G.S. Bulletin 1136, U.S. Gov't. Printing Office, Wash., D.C.

5. "Analysis of Alaska Coals," U.S. Bureau of Mines Technical Paper #682, 1946 (details the quality and location of Alaska coal showings), U.S. Gov't. Printing Office, Wash., D.C.

6. "Bituminous Coal Data, 1962," published by the National Coal Association, 1130 17th St. N.W., Wash., D.C., June 1963, p. 23.

7. "Minerals Yearbook, 1962," Vol. 2: Fuels, U.S. Bureau of Mines Staff, U.S. Gov't. Printing Office, Wash., D.C., 1963, p. 65.

8. Same as 7, pages 71-73, 121-123.

9. Same as 7, page 87.

10. Same as 7, p. 153.

11. "Steam-Electric Plant Construction Costs and Annual Production Expenses," 14th Annual Supplement, U.S. Gov't. Printing Office, Wash., D C., 1961, p. xv.

12. "Fortune," Dec. 1962, A Billion Dollar Coal Market?, by George Tugendhat, p. 102.