

LMFS-8 (RFP-92-7)
LIGNITE NICHE MARKET STUDY

CONTRACTOR: Charles River Associates

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CONTRACT AMOUNT: \$89,900

Project Schedule – 6 Months

Contract Date – 8/22/92

Start Date – 8/22/92

Completion Date – 5/10/93

Project Deliverables

Status Report – 11/30/92 ✓

Monthly Progress Reports ✓

Draft Final Report – 1/93 ✓

Final Report – 5/10/93 ✓

OBJECTIVE / STATEMENT OF WORK

The purpose of this study was to obtain and evaluate niche market potential of specialty products from North Dakota lignite. The objective of this study was to evaluate current and emerging national and international technologies for producing specialty products from coal and find which one can be used with North Dakota lignite. The technologies would take advantage of the unique properties of North Dakota lignite and offer a high probability for rapid commercialization. A specialty product is defined as any fuel or non-fuel product from lignite other than fuel for conventional large-scale coal-burning boilers and power plants. The work includes an independent evaluation of technical and economic merit of technologies. Also included is market potential of the specialty products derived from lignite. Products evaluated included, but were not limited to, activated carbon, humate based fertilizers, humic acid based adsorbents, coal/water slurry fuel, and char adsorbent for toxic pollutants in flue gas. The evaluation:

- 1) lists the most promising processes,
- 2) suggests the quantity of products being marketed,
- 3) notes any process improvements,
- 4) assesses probability of commercialization in the next five years,
- 5) makes an estimate of preliminary relative costs, and
- 6) estimates potential for improvement in costs.

STATUS

Charles River Associates concluded that with sufficient technical development and product marketing, an additional \$11 - \$25 million (1993 dollars) of new business could be generated from lignite specialty products in niche markets. The best near-term commercial opportunities are granular activated carbon, rheology control products, and powered activated carbon. These products may add less than 1 percent to total lignite production, but could produce significant economic development within North Dakota.

Seven specialty product niche markets were ranked in the study. A value of five was assigned as the highest ranked score, and zero as the lowest ranked score. A summary of the ranking and scores is shown as follows:

Niche Market	Technical Success	Commercial Success	Market Value	Total Score	Rank
Granular Activated Carbon	3	4	5	12	1
Rheology Control	4	3	4	11	2
Powdered Activated Carbon	4	3	3	10	3
Soil Conditioners	4	2	2	8	4
Drilling Mud Additives	5	1	0	6	5
Water Treatment	2	2	2	6	6
Coal/Water Fuel	4	1	0	5	7

The following information was used to develop the ranking and scores:

- Granular Activated Carbon – the potential new market for granular activated carbon is estimated to be 80 million to 180 million pounds by the year 2000. Development of a performance based granular carbon based on North Dakota lignite could capture 10% of the market. The product could sell at a conservative \$1 per pound. The technology to produce granular activated carbon still needs to be fully developed, but commercial prospects are good.
- Rheology Control Products – the potential new market for rheology control in alumina production was estimated at 60,000 tons in 1991. Assuming a market share of 15-25%, combined with other applications, the market is estimated to be 20,000 to 40,000 tons by the year 2000. The product of dried lignite could sell for \$100 per ton. Commercialization is dependent on environmental priorities of the alumina producers.
- Powdered Activated Carbon – the potential new market for powdered activated carbon is estimated at 20,000 pounds. This product, from North Dakota lignite, could capture 15-30% of the market. At \$0.50 per pound, this represents \$1-2 million annually. Technical and commercial success is high, because plant testing has shown that lignite-based activated carbon performs well.
- Soil Conditioners – the current market for lignite and leonardite as a soil conditioning agent is estimated to be 10,000 tons per year. The potential new open market is

estimated to be zero to 5,000 tons per year by the year 2000. Minimal processing is required. Commercial success is low because of the abundance of competitive products and feedstock.

- Drilling Mud Additives – without dramatic price increases for crude oil, no incremental growth is anticipated. No technical barriers exist. Commercial success is not likely.
- Water Treatment – the potential new market for lignites used in water treatment is estimated to be zero to 5,000 tons by the year 2000. At \$100 per ton, this market is valued at zero to \$0.5 million. Many technical uncertainties exist. Likelihood of commercial success is very low.
- Coal/Water Fuel – no potential new markets exist for North Dakota lignite as a coal/water fuel in the 1990's. The technology has been proved and is beginning to find commercial applications in Japan. However, production from North Dakota lignite is not feasible with the high processing cost and the low price of competing fuels.

Projected new production and new employment that could be realized from the commercialization of the three top ranked niche market specialty products are summarized as follows:

Niche Market	New Lignite Production (000 tons)	Market Value (\$million)	Direct Employment (man years)	Indirect Employment (man years)	Total Employment (man years)
Granular Carbon	120-270	8 – 18	40 – 50	120 – 150	160-200
Rheology Control	20 – 40	2 – 4	15 – 20	45 – 60	60 – 80
Powdered Carbon	3 – 6	1 – 2	20 – 30	60 – 90	80 – 120
Total	143 – 316	11 – 24	75 – 100	225 – 300	300 – 400

It was recommended that development be focused on technologies to produce granular activated carbon. Collaborative opportunities with existing developers and producers of granular activated carbon should be explored. Granular activated carbon should be produced from North Dakota lignite and the product characterized.