

**LMFS-4 (RFP-92-2)**  
**LIGNITE TRANSPORTATION STUDY**

**CONTRACTOR:** Corporate Strategies, Inc.

**PRINCIPAL INVESTIGATOR:** Robert H. Leilich  
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**CONTRACT AMOUNT:** \$51,459

**Project Schedule – 1 year**

Contract Date – 8/30/92  
Start Date – 8/30/92  
Completion Date – 12/5/92 (delayed)  
Completed – 3/25/93

**Project Deliverables**

Status Report – 9/30/92 ✓  
Status Report – 11/30/92 ✓  
Draft Final Report – 1/21/93 ✓  
Final Report – 3/25/93 ✓

**OBJECTIVE / STATEMENT OF WORK**

The objective of this study is to estimate the costs of shipping an upgraded North Dakota lignite (NDL) to potential users in Europe and the Great Lakes area. The study was to identify all individual components of rail and ocean shipping costs to the Great Lakes and Europe and to analyze and estimate ways to reduce costs. Similarly, the study was to identify the costs of shipping an upgraded Powder River Basin (PRB) coal to Europe, via the Gulf Coast. Also, the study was to compare the cost of delivered upgraded NDL and PRB coal in the Great Lakes area and Europe and to consider the cost of an alternative coal slurry pipeline transport for overland routes.

**STATUS**

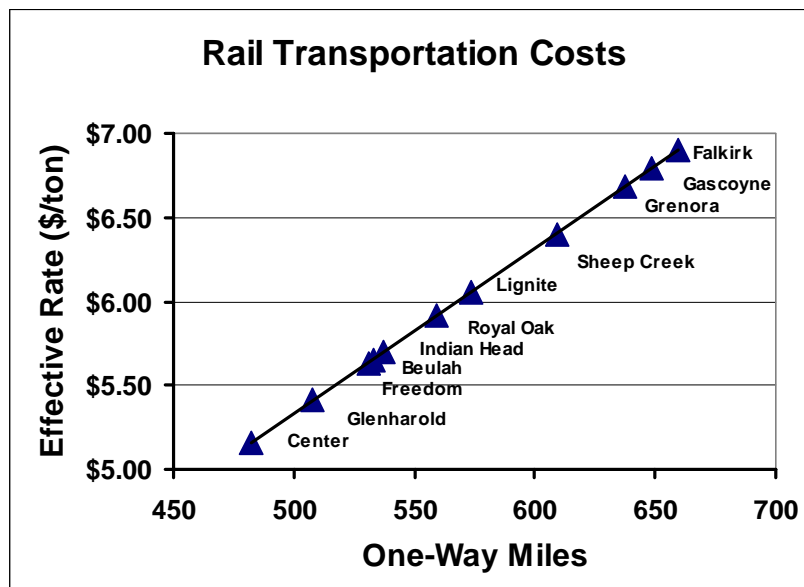
**This STUDY IS a COST-BASED RATE analysis of the economics of coal transportation and distribution. This STUDY IS NOT a CONTRACT-BASED RATE analysis since such information is proprietary and confidential.** The contractor has 13 years of experience in rate negotiations with western railroads. Based on the contractor's experience, cost-based rates of 155-165 percent of variable costs are a median range of confidential coal transportation rail contracts where competition or other coal sourcing or transportation alternatives do not exist. In most competitive markets, the rate may be 110-120 percent.

Specifically, the study encompasses the costs and coal logistics of moving NDL and PRB coal from the mine, via rail, to the Great Lakes and Mississippi River, and by ship to Europe. Burlington Northern is the only logical rail carrier to handle NDL. Rail distances to deliver NDL to the Lake Superior Midwest Energy Transload Terminal range from a low of 482 miles from the Center mine, to a high of 645 miles from the Gascoyne mine. The most cost effective rail transportation alternative is lightweight aluminum gondola 115 car unit trains. CSI used a 160% markup for estimating most likely rate levels for this study.

Rail transportation costs for eleven sites in North Dakota to the Lake Superior Midwest Energy Terminal in Superior, Wisconsin are summarized as follows:

**RAIL TRANSPORTATION COSTS**  
**NDL TO GREAT LAKES**  
 115 Car Unit Trains  
 Lightweight Aluminum Cars  
 Average Tons Per Car = 107.5  
 All Expenses \$/Car; Costs and Rate \$/Ton  
 Third Quarter 1992 Level

Mine/Area Origin	One-Way Miles	Expense F(miles)	Other Expenses 160% - Base	Total Costs	Effective Rate <sup>1</sup>
Center	482.0	\$303.80	\$68.51	\$3,463	\$5,159
Glenharold	508.0	\$318.42	\$72.11	\$3,633	\$5,410
Freedom	530.8	\$331.45	\$75.32	\$3,784	\$5,634
Beulah	533.0	\$332.71	\$75.64	\$3,799	\$5,655
Indian Head	537.4	\$335.22	\$76.25	\$3,828	\$5,699
Royal Oak	559.5	\$347.85	\$79.37	\$3,974	\$5,915
Lignite	573.4	\$355.79	\$81.32	\$4,066	\$6,052
Sheep Creek	609.2	\$376.24	\$86.35	\$4,303	\$6,403
Grenora	637.6	\$392.47	\$90.36	\$4,491	\$6,682
Gascoyne	648.5	\$398.70	\$91.90	\$4,564	\$6,789
Falkirk	659.6	\$424.93	\$95.87	\$4,845	\$6,898



<sup>1</sup> Regression based equation used to determine the effective rate  
 Effective Rate = [(\$28.18 - \$.571 \* Miles) \* Markup % + \$.59 - \$.141 \* Miles]/Tons Per Load

Rail transportation costs were projected from two mines in the northern area of the PRB to the Great Lakes and from three mines in the southern PRB to the Mississippi River. The PRB data is compared to the low and high values for NDL to the Great Lakes in the following table.

Mine/Area Origin	One-Way Miles	Effective Rate (160%-Base) \$/Ton
NDL to Great Lakes		
Center	482.4	\$5.16
Falkirk Mine	659.6	\$6.90
Northern PRB to Great Lakes		
Absaloka Mine	854.5	\$9.40
Spring Creek/Decker	1046.7	\$11.41
Southern PRB to Mississippi River		
Reno, WY to Peavey Dock	969.4	\$10.54
Reno, WY to Cora Dock	1941.6	\$11.21
Reno, WY to Western Terminal	1170.2	\$12.70

The Reno, Wyoming location serves Arco's Black Thunder Mine and Kerr-McGee's Jacob's Ranch Mine. The Black Thunder Mine is the largest open pit mine in North America. The NDL has a \$4 to \$6 per ton advantage over Montana PRB shipment to the Great Lakes. These values are effective transportation rates and should not be interpreted as negotiated delivered coal costs. Based on many factors, negotiated rates can be higher or lower than the above estimates.

The delivered cost of upgraded coal from the southern PRB, northern PRB and NDL at Rotterdam, Immingham and Valencia in Europe were projected. Coal costs and upgrading costs for this study are summarized in the following table.

#### Coal and Energy Factors for Logistics Study

	Southern PRB		Northern PRB		NDL	
	Low	High	Low	High	Low	High
FOB Mine (\$/Ton)	4.00	5.50	6.50	7.50	6.00	7.50
Upgrading (\$/Ton)	10.00	14.00	10.00	14.00	10.00	14.00
HHV (Btu/lb)	10,500	11,000	10,500	11,000	10,500	11,000

This information was used with the other transportation information from the study to project values for delivered coal. The following table summarizes only the highest and lowest value for the low and high coal costs and the use of lightweight aluminum 115 car unit trains. The costs are projected for southern PRB coal shipped by rail to the Great Lakes, northern PRB coal shipped by rail to the Mississippi River, and NDL shipped by rail to the Great Lakes.

A Comparison of Delivered Cost  
Estimates to Europe  
\$/MMBtu

	Southern PRB		Northern PRB		NDL	
	Low	High	Low	High	Low	High
Rotterdam	1.87	2.77	1.99	2.93	1.78	2.70
Immingham	1.89	2.80	2.01	2.96	1.80	2.72
Valencia	1.91	2.77	2.04	2.98	1.83	2.74

The values in this study were generated on a comparable basis. They do not necessarily represent negotiated rail rates and delivered prices. The study completed by Corporate Strategies, Inc. is a two-volume report. Conclusions should be reached only cautiously after reviewing the entire report.

The impact of the Clinton Administration's proposed energy tax was not included in this study. However, a \$0.50 per gallon tax on diesel fuel could add \$0.38 per ton to a \$5.00 per ton rail transportation rate. Fuel costs represent 12 percent of the cost of rail transportation.