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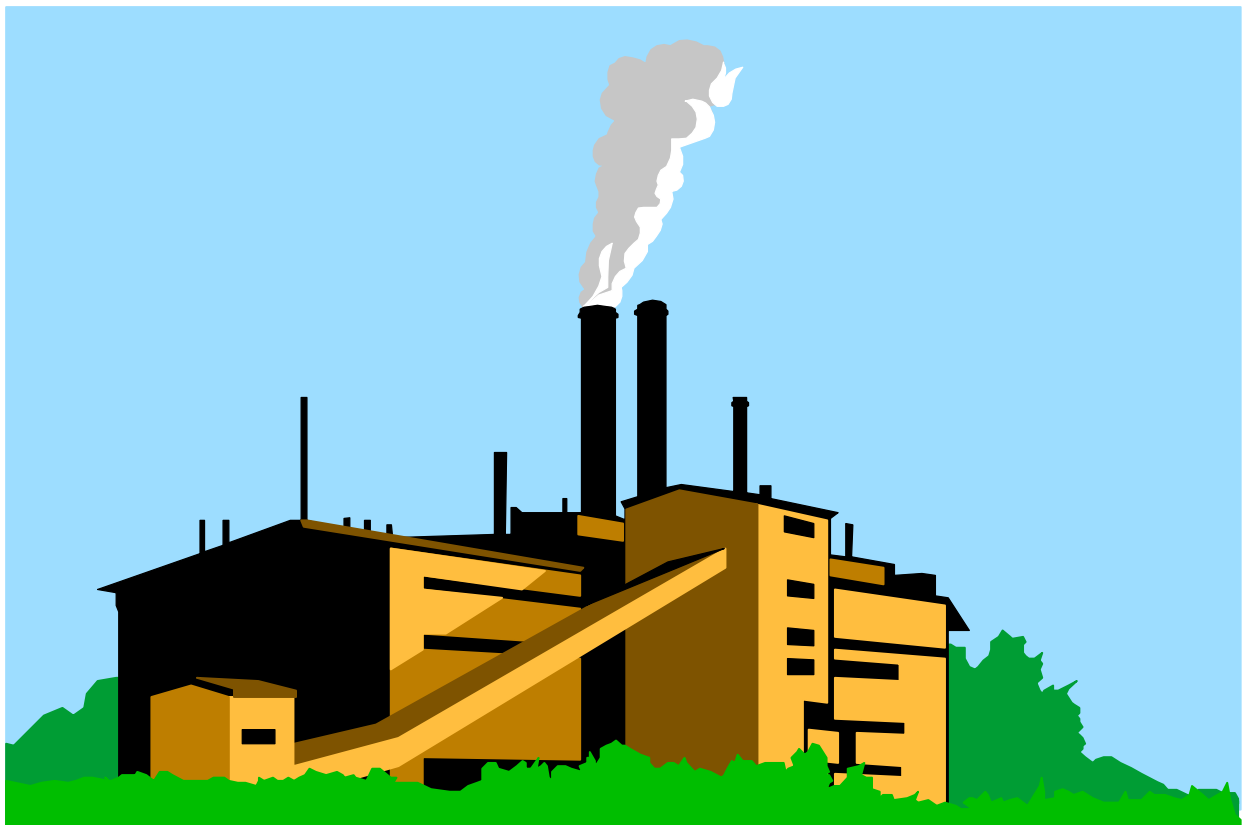
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North Dakota Lignite Energy Industry's Contribution to the State Economy

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Abstract

The lignite energy industry of North Dakota has become a significant force in the state's economy since the energy crisis of the 1970s. Key economic measures of the industry's contribution to the state's economy have been estimated annually since 1982. Industry expenditures peaked in 1995 at \$543.8 million, excluding the early 1980s when significant plant expansion was occurring. Annual expenditures have been over \$400 million since the early 1990s and were \$464.9 million in 1998, the most recent year of the analysis. Lignite energy related expenditures were applied to the input-output multipliers to estimate levels of business activity. Personal income resulting from the industry was estimated at \$490.5 million in 1998, with retail sales at \$320.6 million for the same period. Total business activity resulting from the lignite industry amounted to over \$1.4 billion in 1998. The industry has generated over \$1 billion in total business activity annually from 1982-1998, except for 1987. Tax revenues resulting from the industry's activities totaled \$63.4 million in 1998, and were over \$50 million in all but two years from 1982-1998. The largest tax revenue source was the coal severance tax which grew from \$17.5 million in 1982 to \$27.7 million in 1992, and was \$23.6 million in 1998. Industry-wide direct employment has declined from 6,458 to 3,078 workers between 1982 and 1998. Secondary (indirect and induced) employment has also declined during the study period, declining from 31,981 to 17,175 full time equivalent jobs. The lignite energy industry has contributed significantly to the North Dakota economy as its expenditures have resulted in higher levels of personal income, retail sales, business activity, tax revenues, and employment within the state.

Keywords: lignite energy, economic contribution, personal income, retail sales, tax revenue, employment

Introduction

North Dakota's economy is highly dependent upon natural resource based activities. These activities include lignite coal mining and conversion, petroleum extraction and refining, and agricultural production. Of these, the lignite industry has shown the most stable and consistent growth because it has not been subject to the price swings that have impacted the oil and agricultural industries. Coal production in North Dakota has grown from about 2.5 million tons mined per year in the 1960s to nearly 30 million tons annually in the 1990s. This expansion has resulted in the lignite energy industry becoming a significant force in the state's economy during that period. Much of this growth was in response to the oil embargos of the 1970s as there was a strong incentive to promote expansion of domestic energy reserves. The lignite energy industry's contribution to the North Dakota economy has been measured annually in terms of economic variables, since 1982 [Coon et al. (1983) and Coon and Leistritz (annually 1985-1999)]. These studies provide data on the importance of the lignite energy industry to the state's economy.

Estimates of the lignite industry's contribution to the North Dakota economy can be measured using key economic indicators such as retail trade activity, personal income, total business activity, employment, and tax revenues. These estimates were based on actual industry expenditures, which were obtained from an annual survey of firms involved in lignite related activities (mining or conversion) in North Dakota.

Methodology

Economic contributions to the state have been analyzed using the North Dakota Input-Output Model. The model uses interdependence coefficients, or multipliers, that measure the total level of gross business volume generated in each sector from an addition dollar of sales to final demand in a given sector. Expenditures of companies involved in lignite-related activities in North Dakota, which were collected annually for the 1982-1998 period, provided the basic data for the study. These industry expenditures were applied to the input-output model's interdependence coefficients to estimate levels of business activity. For a complete description of the input-output model, a listing of the coefficients, and how the model can be used to perform an economic contribution study, see Coon et al. (1985 and 1989). Resulting levels of business activity were used to estimate tax revenues and indirect and induced employment, based on historic relationships (Coon et al. 1992). All values in this analysis are expressed in terms of current year dollars, (i.e. nominal dollars).

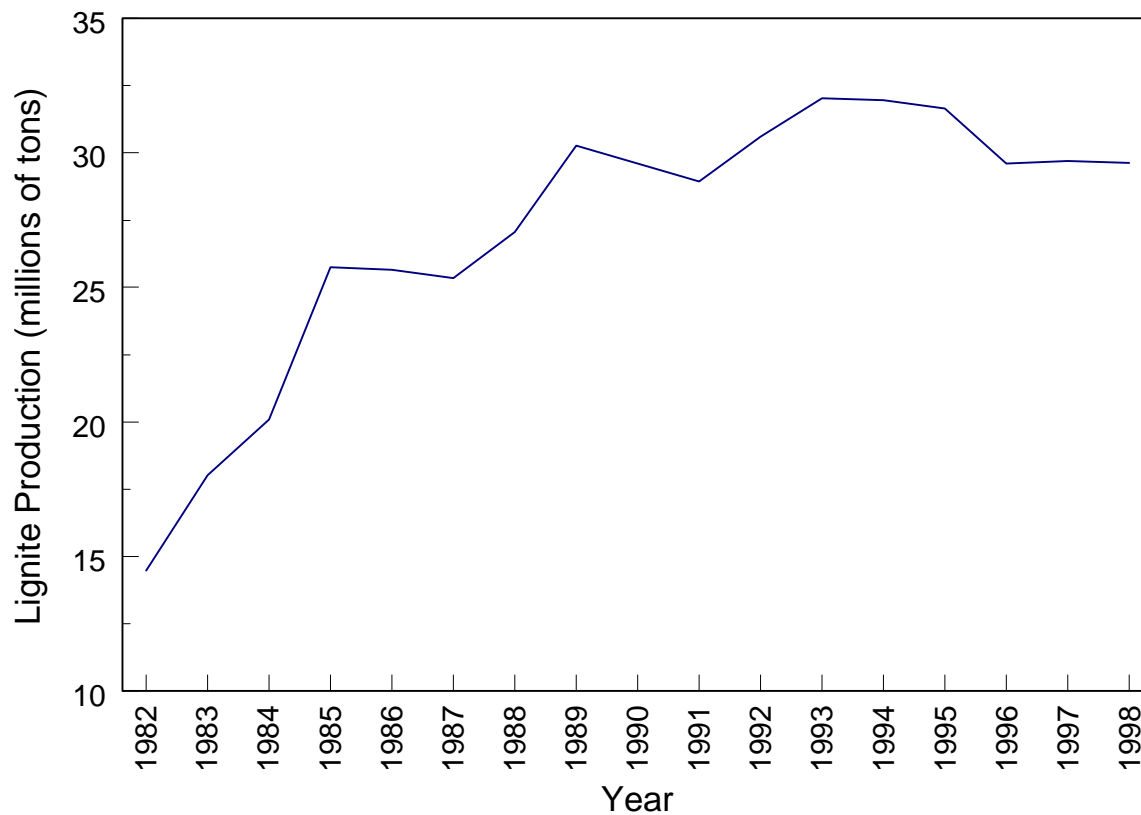
Expenditures by firms involved in lignite related activities were assumed to work their way through the local economy the same as other firms in other sectors. Because of the capital intensive nature of the lignite industry, the ratio of secondary employment to direct jobs is higher for the lignite industry than some of the other sectors of the state's economy. Firms in the lignite industry have higher levels of expenditures per employee than do most other economic sectors in the state. This analysis provides a look at the long term economic contribution of the lignite energy industry to the state.

Economic Contribution

Production of lignite coal in North Dakota

has doubled from 1982 to 1998, going from over 14 to nearly 30 million tons (Figure 1). Production peaked in 1993 at slightly over 32 million tons and has declined slightly since that time. Industry expenditures follow a very similar pattern, peaking in 1995 (excluding the early 1980s when significant plant expansion was occurring). Expenditures were \$550.2 million in 1983 and \$543.8 million in 1995 (Table 1). Expenditures data were collected by economic sector and applied to the input-output model to estimate levels of business activity for each sector. Total annual expenditures from 1982 to 1998 for all sectors are presented in Table 1. Lignite energy firms have increased their expenditures at a rather stable rate from 1987 to 1998; since 1995 expenditures have declined slightly. The industry still added over \$460 million dollars of direct expenditures to the state's economy in 1998.

The North Dakota Input-Output Model estimates business activity for each of the model's sectors. Key economic measures can be obtained from this input-output analysis. Personal income, retail sales, business activity for all business sectors, and total business activity as a result of lignite energy expenditures were estimated by the model (Table 2). Personal income generated as the result of coal-industry expenditures was estimated at \$490.5 million in 1998. It peaked at \$531.0 million in 1995, and in the 1990s has consistently added over \$400 million in personal income for North Dakota. Retail sales associated with lignite energy also hit its highest level in 1995 at \$369.1 million. Retail sales have increased by over \$300 million since the mid 1990s because of the lignite industry. Total business activity generated from lignite energy expenditures were over one billion dollars every year of the study except for 1987. Total business activity peaked in 1995 at nearly \$1.6 billion and was over \$1.4 billion in 1998, the year most recently analyzed.



Source: Office of the State Tax Commissioner (1982-1998)

Figure 1. Production of Lignite Coal in North Dakota, 1982-1998

Table 1. Estimated North Dakota Direct Expenditures for Companies Involved in Lignite-Related Activities, 1982-1998

Year	Expenditures
	-----million dollars-----
1982	523.7
1983	550.2
1984	414.7
1985	401.4
1986	346.2
1987	316.8
1988	343.9
1989	360.3
1990	383.6
1991	375.7
1992	420.2
1993	425.8
1994	457.3
1995	543.8
1996	516.0
1997	453.1
1998	464.9

Table 2. Estimated Direct and Indirect Personal Income, Retail Sales Activity, Business Activity for All Business Sectors, and Total Business Activity for Companies Involved in Lignite-Related Activities, 1982-1998

Year	Personal Income	Retail Sales	Business Activity For All Business Sectors	Total Business Activity
-----million dollars-----				
1982	402.3	299.0	883.9	1,370.6
1983	450.6	325.2	921.0	1,466.5
1984	436.7	292.6	685.7	1,220.4
1985	424.1	268.3	689.5	1,202.5
1986	370.0	236.8	595.6	1,046.8
1987	336.8	199.4	553.5	969.1
1988	373.6	226.6	584.5	1,037.8
1989	389.4	241.4	623.8	1,101.1
1990	399.3	249.8	667.4	1,154.6
1991	379.2	267.4	648.3	1,115.1
1992	425.6	287.8	724.2	1,243.8
1993	442.2	286.4	742.0	1,283.5
1994	466.2	318.6	789.6	1,360.0
1995	531.0	369.1	930.1	1,568.6
1996	506.4	361.9	894.7	1,513.6
1997	474.4	317.2	794.9	1,375.8
1998	490.5	320.6	825.0	1,423.3

Using generated values for personal income, retail sales, and business activity for all business sectors, personal income tax, sales and use tax, and corporate income tax can be estimated using historic relationships. Data from the industry survey provided coal severance, energy conversion, and other tax payments by the lignite energy industry. Table 3 presents tax revenues resulting from coal industry activities. The largest tax revenue source was the coal severance tax which almost every year contributed over \$20 million to state tax revenues. In 1998 coal severance tax amounted to \$23.6 million. Energy conversion and sales and use tax collections were similar at \$14.6 million and \$14.8 million in 1998, respectively. Total tax collections resulting from lignite-related activities have grown from \$38.2 million in 1982 to \$63.4 million in 1998. This represents a 66 percent increase during the 17-year period. Total tax revenues have remained over \$60 million since 1988.

Another important aspect of the coal industry is the number of jobs it has added to the North Dakota economy. Direct employment peaked at 7,996 workers in 1983, during a time of plant development in the industry (Table 4). Employment generally remained around 3,500 jobs until 1997. Since 1997 there have been mine closings reducing direct employment. Besides those directly employed in the lignite energy industry, expenditures by the industry also create secondary, or indirect and induced jobs. Secondary jobs closely correspond with expenditures, and have remained relatively stable. Secondary employment was estimated at 17,175 in 1998, and was generally around 15,000 jobs during the 1990s. Secondary jobs are distributed throughout the remaining sectors of the state's economy.

Table 3. Estimated State Tax Revenue Resulting from Activities of Companies Involved in Lignite-Related Activities, 1982-1998

Year	Coal Severance	Energy Conversion	Sales and Use	Personal and Corporate Income	Other	Total
-----million dollars-----						
1982	17.5	3.7	9.3	6.5	1.2	38.2
1983	18.7	4.1	10.1	7.2	1.3	41.4
1984	22.0	10.9	11.9	11.3	2.5	58.6
1985	27.0	12.7	10.9	11.1	6.2	67.9
1986	26.2	8.7	9.6	9.6	4.2	58.3
1987	22.3	10.0	8.1	8.8	5.6	54.8
1988	22.4	12.3	9.2	9.7	6.5	60.1
1989	25.5	12.0	9.8	10.1	5.5	62.9
1990	25.4	12.5	10.1	10.5	5.4	63.9
1991	24.4	11.9	12.4	6.9	0.8	56.4
1992	27.7	13.1	13.3	7.8	1.5	63.4
1993	24.7	13.7	13.3	8.1	1.6	61.4
1994	24.8	15.5	14.7	8.5	1.5	65.0
1995	23.0	14.9	17.1	9.8	1.6	66.4
1996	23.6	15.0	16.8	9.4	1.5	66.3
1997	23.2	14.3	14.7	8.6	1.5	62.3
1998	23.6	14.6	14.8	8.9	1.5	63.4

Table 4. Estimated Direct and Secondary Employment for Companies Involved in Lignite-Related Activities, 1982-1998

Year	Employment	
	Direct	Secondary
1982	6,458	31,981
1983	7,996	32,211
1984	5,562	22,644
1985	3,942	19,745
1986	3,805	16,912
1987	3,785	14,393
1988	3,668	13,649
1989	3,551	14,311
1990	3,455	14,305
1991	3,414	14,237
1992	3,384	15,201
1993	3,705	15,081
1994	3,533	15,706
1995	3,693	16,556
1996	3,574	16,276
1997	3,078	15,724
1998	3,078	17,175

Conclusions

The contribution the lignite energy industry has made to the North Dakota economy has been analyzed since 1982. Since that time, the industry has grown significantly and has become a major factor in the state's economy. It also has gone through some changes during this period, as what looked like an unlimited demand for North Dakota's lignite and its products has stabilized. Lower world energy prices have a profound effect on the state's energy industry. The industry appears to have stabilized with coal production remaining relatively constant during the past 10-year period.

Lignite energy industries have contributed to the state's economy in many ways. They have provided jobs and generated increased levels of business activity, which produced higher personal income and retail sales. Tax revenues generated in North Dakota as the result of the coal industry have provided a significant contribution to the state's revenues. Economic contributions associated with the lignite energy industry have provided the impetus for growth and stability in the North Dakota economy.

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