North Dakota Lignite Energy Industry

Economic Contribution Analysis

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Preface

This report is the latest biennial assessment of the economic contribution of the North Dakota lignite energy industry.

Data for this study came from industry surveys, state and federal agencies, and other secondary sources,

The definition of the lignite energy industry and methods used to estimate its economic contribution are consistent with studies examining the economic contribution of other industries in the state. As usual, these studies are snapshots in time and economic contributions often vary from year to year with commodity-based industries.

Industry Highlights

The following figures are based on activity during 2023 and projections of industry output in 2024. All values include direct and secondary economic output.

North Dakota Lignite Energy Industry in 2023
- ❖ $5.54 billion gross business volume
  - ❖ $0.87 billion from mining
  - ❖ $3.16 billion from coal conversion and electricity generation
  - ❖ $1.51 billion from transmission/distribution
- ❖ 12,030 jobs (direct and secondary)
  - ❖ 3,400 jobs supported by mining
  - ❖ 7,400 jobs supported by coal conversion and electricity generation
  - ❖ 1,200 jobs supported by transmission/distribution
- ❖ $107 million in local and state government revenues

North Dakota Lignite Energy Industry in 2024
- ❖ $5.49 billion gross business volume
  - ❖ $0.93 billion from mining
  - ❖ $3.03 billion from coal conversion and electricity generation
  - ❖ $1.53 billion from transmission/distribution
- ❖ 11,910 jobs (direct and secondary)
  - ❖ 3, 400 jobs supported by mining
  - ❖ 7,310 jobs supported by coal conversion and electricity generation
  - ❖ 1,160 jobs supported by transmission/distribution
- ❖ $100 million in local and state government revenues

Understanding the Numbers

Economic contribution assessments measure the gross size of an industry or economic sector.

Size is estimated by combining *direct* or first-round effects (i.e., sales, spending, and/or employment) with economic modeling to estimate secondary effects of business-to-business transactions (*indirect*) and household spending for goods and services (*induced*).

Economic measures frequently used in economic contribution assessments:
- ❖ **Labor income** – earnings of workers and sole proprietors
- ❖ **Employment** – wage and salary jobs and sole proprietor/self-employed jobs
- ❖ **Gross business volume** – includes direct sales of products and services of the industry being measured, and sum of all business-to-business and household-to-business transactions associated with indirect and induced economic activity
- ❖ **Value-added** – represents share of gross state product

An overview and additional information on study methods, data sources, and economic definitions are appended to the end of this report.

Composition of Lignite Energy Industry

Coal Mining: this segment involves the process of extracting lignite coal and delivering it to conversion facilities.

Coal Gasification: this segment involves converting lignite coal into chemicals and other products. It is grouped with electricity generation segment of the industry.

Electricity Generation: this segment burns lignite coal to produce electricity.

Transmission and Distribution: this segment includes moving electricity to local (in-state) distributors and exporting electricity to out-of-state markets.

Industry Contribution 2023

Coal mining had 1,177 direct jobs; business activity relating to coal mining operations supported another 1,155 jobs. Personal spending on goods and services by employees working in the coal mining sector and employees of businesses affected by coal mining supported an additional 1,060 jobs. The combined effects on statewide employment from coal mining was estimated at 3,400 jobs. Other economic effects from coal mining included $345 million in labor income and $874 million in gross business volume.

Coal conversion and electricity generation from lignite was estimated to have nearly 1,500 direct jobs, and business activity relating to those lignite operations supported another 4,650 jobs. Personal spending on goods and services by employees working in the coal conversion and generation activities and employees of businesses affected by those activities supported an additional 1,300 jobs. The combined direct, indirect, and induced effects on statewide employment from coal conversion and electricity generation was estimated at 7,400 jobs. Other economic effects from coal conversion and electricity generation included $570 million in labor income and nearly $3.16 billion in gross business volume.

Electricity transmission and generation from lignite-based activities was estimated to have 569 direct jobs; business activity relating to those lignite operations supported another 320 jobs. Personal spending on goods and services by employees working in coal-related electricity transmission and distribution and employees of businesses affected by those activities supported an additional 330 jobs. The combined direct, indirect, and induced effects on statewide employment from coal-related electricity transmission and distribution was estimated at 1,220 jobs. Other economic effects from transmission and distribution included $105 million in labor income and $1.5 billion in gross business volume.

The combination of coal mining, coal conversion, coal-fired electricity generation, and electricity transmission and distribution was estimated to have 3,228 direct jobs in North Dakota in 2023. These lignite coal activities supported about 6,130 jobs through business purchases of goods and services in the state. The combined personal spending of employees in the Lignite Industry, and employees of businesses involved with supplying goods and services to the industry supported another 2,675 jobs. Collectively, the industry was estimated to support 12,030 jobs in the state.
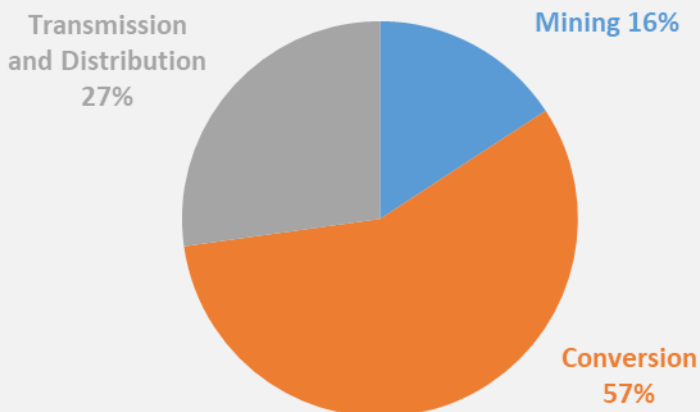
The lignite industry also generated over $1 billion in labor income, which represents wages, salaries, benefits, and sole proprietor's income. The industry also contributed $2 billion to the state's gross domestic product, and the industry's gross business volume was estimated at $5.5 billion.

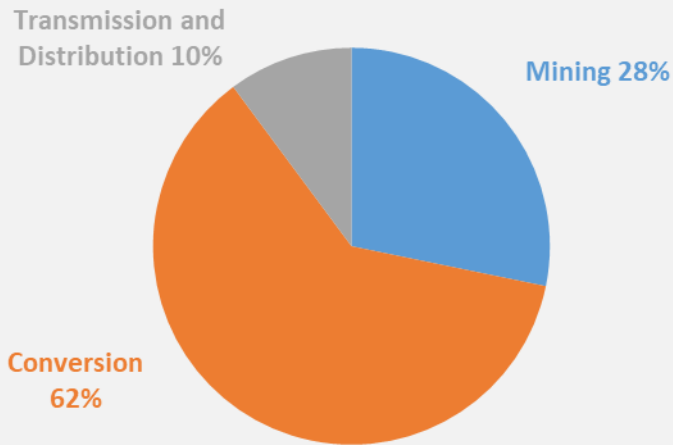| Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, North Dakota Lignite Industry, 2023				
Industry Segment/Type of Economic Effect	Employment[1]	Labor Income	Value-added	Output
Coal Mining		--------------------- millions 2023 $ ---------------------		
Direct effects	1,177	208	249	565
Indirect effects	1,155	79	126	215
Induced effects	1,064	59	96	95
Total economic effects	3,396	345	472	874
Electricity Generation and Coal Conversion				
Direct effects	1,482	173	513	1,804
Indirect effects	4,654	325	644	1,142
Induced effects	1,277	70	116	212
Total economic effects	7,413	568	1,273	3,158
Electricity Transmission and Distribution				
Direct effects	569	59	222	1,314
Indirect effects	323	28	60	139
Induced effects	331	18	30	55
Total economic effects	1,223	105	312	1,508

[1] Employment represents total jobs, and does not represent employment in FTE.

Gross Business Volume, Lignite Energy Industry, 2023

Transmission and Distribution 27%

Mining 16%

Conversion 57%

Direct and Secondary Employment, Lignite Energy Industry, 2023

Transmission and Distribution 10%

Mining 28%

Conversion 62%

Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, North Dakota Lignite Industry, 2023				
Type of Economic Effect	Employment[1]	Labor Income	Value-added	Output
ND Lignite Industry		-------------------- millions 2023 $ --------------------		
Direct	3,228	439	985	3,683
Indirect	6,131	432	830	1,495
Induced	2,673	147	242	362
Total	**12,032**	**1,018**	**2,057**	**5,540**

[1] Employment represents total jobs, and does not represent employment in FTE.

Industry Contribution 2024 (projected)

The following figures and values were based on an industry survey soliciting estimates of calendar year 2024 business activities, although the survey was administered prior to yearend. Firms were asked to estimate what their 2024 revenues and expenditures would be based on data available at the time of the survey and augment that information with expected activities for the remaining months in 2024. Data provided by the industry for 2024 is treated as a projection. However, the projection is considered a reasonable estimate of 2024 since, in many cases, the estimates included actual revenues and expenditures for 10 to 11 months of 2024.

Coal mining had 1,196 direct jobs; business activity relating to coal mining operations supported another 1,168 jobs. Personal spending on goods and services by employees working in the coal mining sector and employees of businesses affected by coal mining supported an additional 1,065 jobs. The combined effects on statewide employment from coal mining was estimated at 3,429 jobs. Other economic effects from coal mining included $356 million in labor income and $931 million in gross business volume.

Coal conversion and electricity generation from lignite was estimated to have 1,407 direct jobs, and business activity relating to those lignite operations supported another 4,684 jobs. Personal spending on goods and services by employees working in the coal conversion and generation activities and employees of businesses affected by those activities supported an additional 1,226 jobs. The combined direct, indirect, and induced effects on statewide employment from coal conversion and electricity generation was estimated at 7,316 jobs. Other economic effects from coal conversion and electricity generation included $581 million in labor income and over $3.0 billion in gross business volume.

Electricity transmission and generation from lignite-based activities was estimated at 543 direct jobs; business activity relating to those lignite operations supported another 332 jobs. Personal spending on goods and services by employees working in coal-related electricity transmission and distribution and employees of businesses affected by those activities supported an additional 287 jobs. The combined direct, indirect, and induced effects on statewide employment from coal-related electricity transmission and distribution was estimated at 1,162 jobs. Other economic effects from transmission and distribution included $96 million in labor income and $1.5 billion in gross business volume.

The combination of coal mining, coal conversion, lignite coal-fired electricity generation, and electricity transmission and distribution was estimated to have 3,146 direct jobs in North Dakota in 2024. These lignite coal activities supported about 6,184 jobs through business purchases of goods and services in the state. The combined personal spending of employees in the Lignite Industry, and employees of businesses involved with supplying goods and services to the industry supported another 2,578 jobs. Collectively, the industry was estimated to support 11,907 jobs in the state.
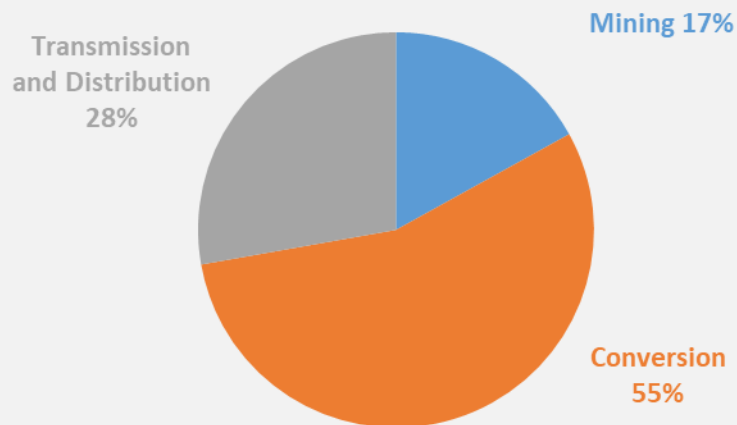
The lignite industry also generated over $1 billion in labor income, which represents wages, salaries, benefits, and sole proprietor's income. The industry also contributed $2.0 billion to the state's gross domestic product, and the industry's gross business volume was estimated at $5.5 billion.

Industry Segment/Type of Economic Effect	Employment[1]	Labor Income	Value-added	Output
Coal Mining		--------------- millions 2023 $ ---------------		
Direct effects	1,196	216	240	609
Indirect effects	1,168	82	134	228
Induced effects	1.065	59	97	95
Total economic effects	3,429	356	470	931
Electricity Generation and Coal Conversion				
Direct effects	1,407	181	502	1,816
Indirect effects	4,684	333	583	1,015
Induced effects	1,226	67	111	204
Total economic effects	7,316	581	1,196	3,034
Electricity Transmission and Distribution				
Direct effects	543	58	275	1,350
Indirect effects	332	23	56	129
Induced effects	287	16	26	48
Total economic effects	1,162	96	358	1,527

Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, North Dakota Lignite Industry, Projected 2024

[1] Employment represents total jobs, and does not represent employment in FTE.

Gross Business Volume, Lignite Energy Industry, 2024

Mining 17%, Conversion 55%, Transmission and Distribution 28%

Direct and Secondary Employment, Lignite Energy Industry, 2024

Transmission and Distribution 10%

Mining 29%

Conversion 61%
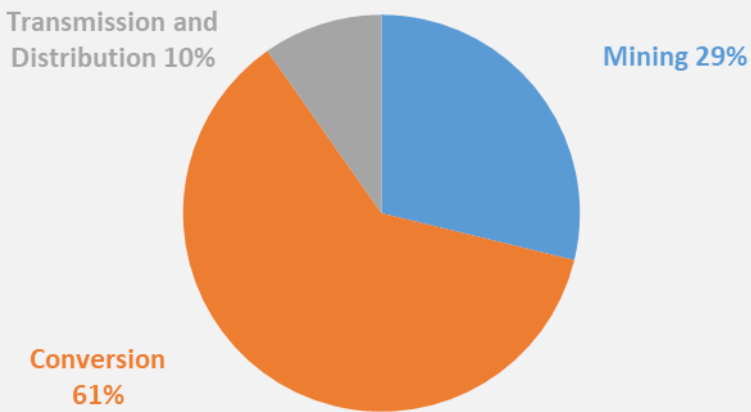
Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, North Dakota Lignite Industry, 2024 (projected)				
Type of Economic Effect	Employment[1]	Labor Income	Value-added	Output
ND Lignite Industry		-------------------- millions 2023 $ --------------------		
Direct	3,146	454	1,017	3,775
Indirect	6.184	438	773	1,372
Induced	2,578	142	234	346
Total	**11,907**	**1,034**	**2,024**	**5,493**

[1] Employment represents total jobs, and does not represent employment in FTE.

Government Revenues 2023

Government revenues are often used as a measure of how effectively an industry supports public services. In North Dakota, the most common sources of in-state public revenues are severance taxes, sales and use taxes, property taxes, and income taxes. A host of other taxes and revenue sources are often tracked in economic contribution and impact assessments, but those sources have varying levels of contribution to government revenue.

The lignite industry was estimated to contribute $52.9 million in government revenues directly from firms in the industry. Tax revenues arising from secondary business activity were estimated to generate an additional $54.4 million in state and local government revenues. A total of $107 million in state and local tax revenues were generated by the Lignite Industry in North Dakota in 2023.
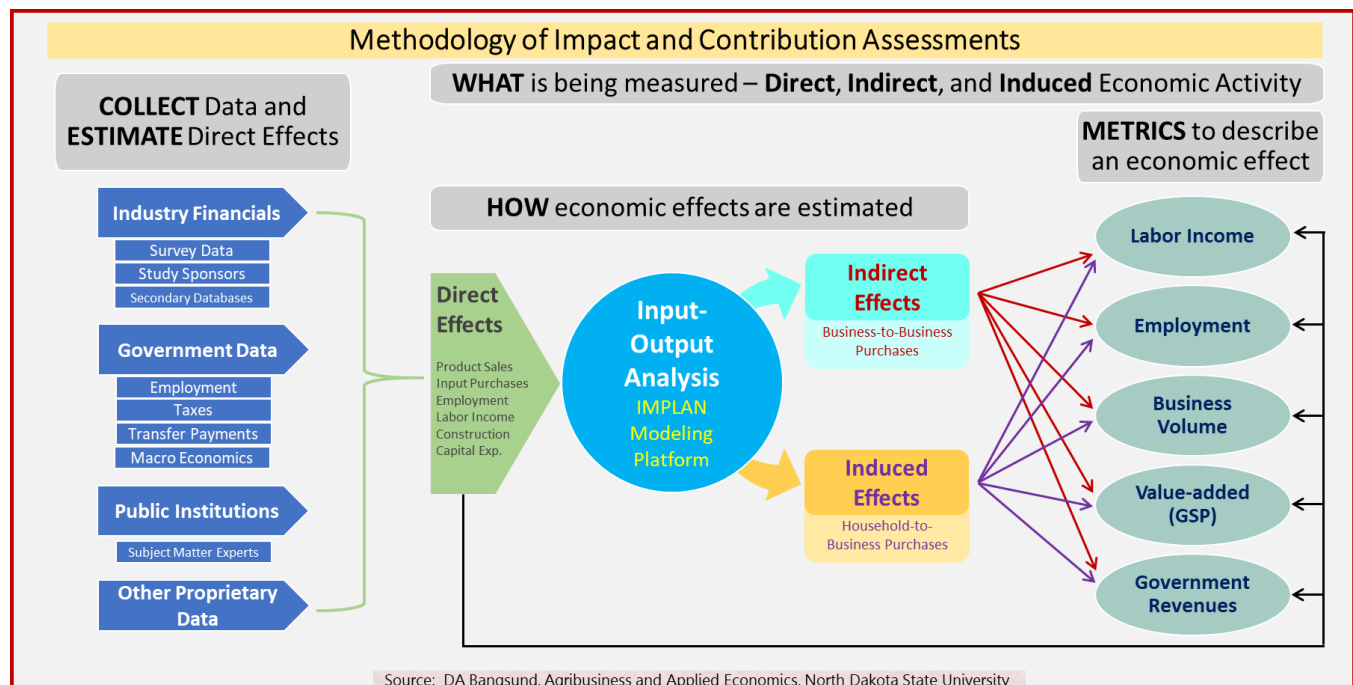
Coal conversion and coal severance taxes were estimated at $13.6 million. Other substantial contributions to state and local government revenues from secondary economic effects were from sales taxes ($25 million) and property taxes ($17.6 million).

State and Local Government Revenues, Lignite Industry, North Dakota, 2023			
Government Revenue	Paid Directly by the Industry	Collected from Indirect and Induced Activity	Total Collections
	---------------------- 000s 2023 $ ----------------------		
Coal Severance Tax	9,379	---	9,378
Coal Conversion Tax	4,223	---	4,223
Sales, Property, and Corporate Income Taxes (reported in survey data)	30,920	---	30,920
Social Insurance Tax	1,489	1,263	2,751
Personal Income Tax	3,053	3,087	6,139
Sales Tax	see above	25,287	25,287
Property Tax	see above	17,582	17.582
Corporate Income Tax	see above	2,151	2,151
Other Taxes	1,088	1,125	2,213
Non Taxes	2,728	3,856	6,584
Totals	**52,880**	**54,350**	**107,231**

Government Revenues 2024 (projected)

The lignite industry was projected to contribute $49.8 million in government revenues directly from the firms in the industry. Tax revenues arising from secondary business activity, based on projections of industry activity, were estimated to generate an additional $50.3 million in government revenues. A projected total of $100.1 million in state and local tax revenues were created by the Lignite Industry in North Dakota in 2024.

Coal conversion and coal severance taxes were estimated at $15.8 million. Other substantial contributions to state and local government revenues from secondary economic effects were from sales taxes ($23 million) and property taxes ($16 million).

State and Local Government Revenues, Lignite Industry, North Dakota, 2024 (projected)			
Government Revenue	Paid Directly by the Industry	Collected from Indirect and Induced Activity	Total Collections
	---------------------- 000s 2023 $ ----------------------		
Coal Severance Tax	9,379	---	9,379
Coal Conversion Tax	4,223	---	4,223
Sales, Property, and Corporate Income Taxes (reported in survey data)	32,463	---	32,463
Social Insurance Tax	1,489	1,302	2,791
Personal Income Tax	3,053	3,191	6,244
Sales Tax	see above	22,995	22,995
Property Tax	see above	15,988	15,988
Corporate Income Tax	see above	2,145	2,145
Other Taxes	1,088	1,023	2,111
Non Taxes	2,728	3,636	6,364
Totals	**54,423**	**50,280**	**104,703**

Supplemental Materials

Economic Contribution Analysis

An economic contribution assessment measures the gross size of some aspect or component of an economy, and is usually measured in conjunction with the overall size of a given economy over a specified period. Size is estimated by combining direct or first-round effects (e.g., industry expenditures, business sales, new employment) with economic modeling to estimate how those first round effects generate business-to-business transactions and household spending on consumer goods and services. Both of those conduits for economic output can be framed using labor income, employment, value-added, gross business volume and government revenues.

Methodology of Impact and Contribution Assessments

Source: DA Bangsund, Agribusiness and Applied Economics, North Dakota State University

Key Terms and Concepts

Direct Effects: First-round of payments for services, labor, and materials and/or sales of an industry's products.

Indirect Effects: Economic activity created through purchases of goods and services by businesses.

Induced Effects: Economic activity created through purchases of goods and services by households.

Industry Output and Gross Business Volume: Industry output is the value of all goods and services produced and supported by an industry. In most industries, output is largely synonymous with sales; however, for some sectors output also includes changes in product inventory. For oil and gas production, direct output includes both sales and inventory adjustments.

When output from business-to-business transactions (*indirect*) and households-to-businesses (*induced*) are measured, they also are described as the *sum of gross receipts* as annual adjustments to inventories are largely unquantified and not distinguished from sales. *Gross business volume* (GBV) therefore includes direct output/sales and includes secondary sales from indirect and induced economic activity.

Value-added: Value-added is synonymous with measures of gross domestic product (GDP) and gross state product (GSP), are some of the most commonly used economic measures to indicate the economic size and change in economic output. However, official government estimates of GDP and GSP do not include secondary economic effects generated by any industry. For lignite energy industry, official government estimates are primarily limited to coal mining, coal conversion, and transmission/distribution. Economic contribution assessments include secondary economic effects, and include GSP from those effects, thereby providing a more realistic and representative portrait of an industry.

Key components of value-added include labor income, consumption of fixed capital, profits, business current transfer payments (net), and income derived from dividends, royalties, and interest. In nontechnical terms, value-added is equal to product value minus production inputs. For example, value-added from coal mining would be the value of coal sold less the value of the inputs consumed in mining the coal. Depreciation charged to durable assets (e.g., buildings, pipelines, processing equipment) are not included in value-added measures.

Employment Compensation: Wages, salaries, and benefits earned by an employee.

Proprietor Income: Payments received by self-employed individuals and unincorporated business owner/operators.

Labor Income: Wages, salaries, and benefits for employees and compensation for self-employed individuals.

Input-output Analysis (I-O): Mathematical application of the interdependence among producing and consuming sectors in an economy.

I-O Matrix: Depiction of an economy using a grid of rows and columns that represents consumption and production for each economic sector in an economy.

Intermediate Inputs: Goods and services consumed in one year to produce another good or service. Intermediate inputs do not include expenditures for capital inputs used for multiple production seasons (e.g., machinery, buildings).

Capital Inputs: Represent the use of inputs to produce another good or service that are not consumed in one production season and are subject to depreciation. *Capital expenditures* represent the purchase of those depreciable assets.

Industry Balance Sheet: Dividing an industry or economic sector into various components for use in estimating the economic effects using input-output analysis. Components of the balance sheet include measures of output, wage and salary employment, self-employment, payroll and proprietor income, other property type income, taxes on production and imports, and intermediate inputs.
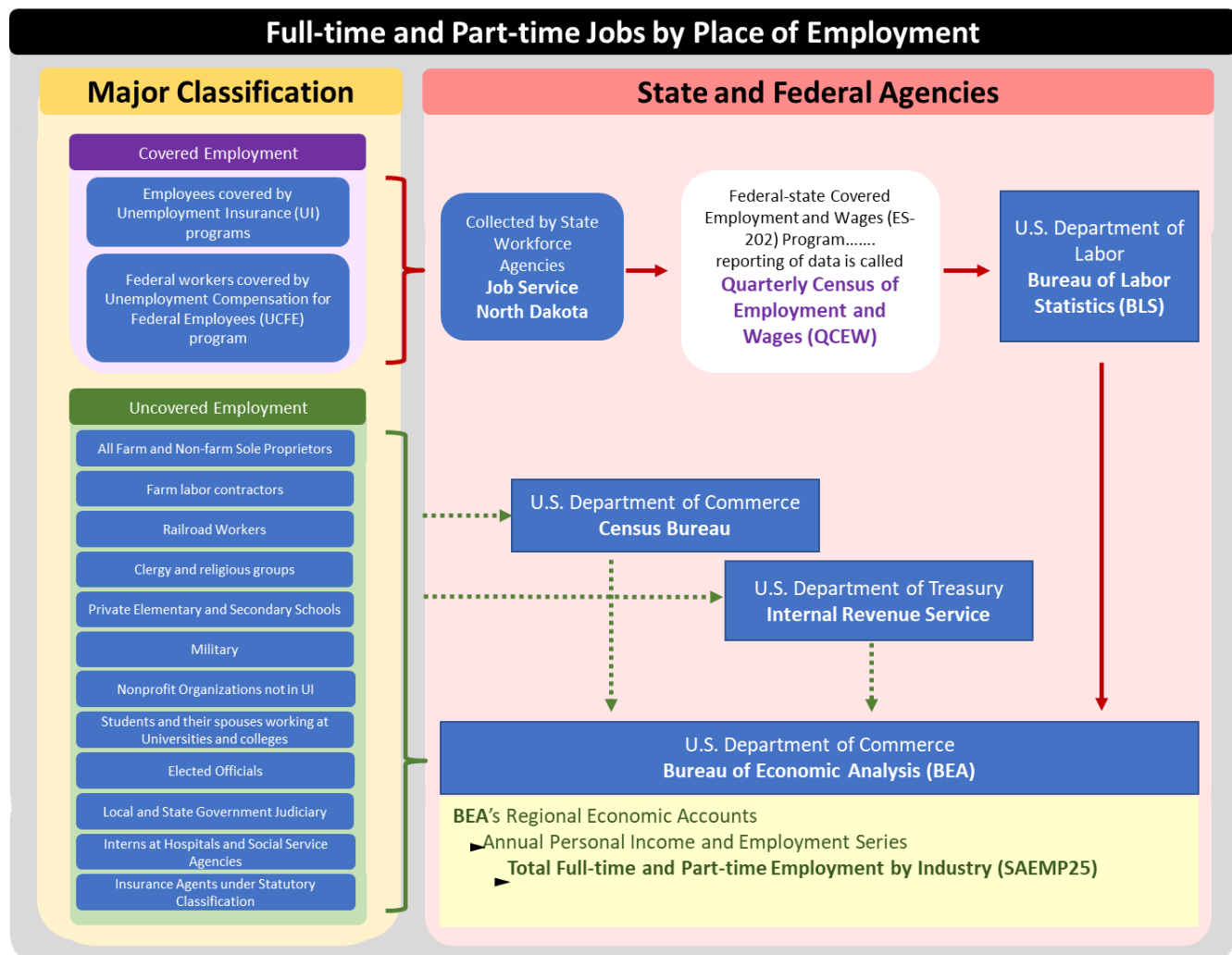
Institutions: Represent governments and other non-private entities consuming goods and services in an economy.

Households: Represent one or more individuals in a specific living arrangement for which income from all sources is used to purchase goods and services.

North American Industry Classification System (NAICS): Government classification system for all goods and services produced in the economy.

Employment Sources and Measures

Employment is broadly measured in two distinct categories: covered and uncovered. Covered workers are those that are employed by a business, institution, or government agency, receive a wage or salary, and are subject to unemployment insurance (UI). Jobs that fall under an UI program are called 'covered' employment. Quarterly Census of Employment and Wages (QCEW) employment reported by Job Service North Dakota is 'covered' employment. QCEW data are collected for each state and reported by the U.S. Bureau of Labor Statistics (BLS). Therefore, employment statistics for self-employed individual cannot be derived from QCEW data.

Full-time and Part-time Jobs by Place of Employment

Major Classification

Covered Employment

- Employees covered by Unemployment Insurance (UI) programs
- Federal workers covered by Unemployment Compensation for Federal Employees (UCFE) program

Uncovered Employment

- All Farm and Non-farm Sole Proprietors
- Farm labor contractors
- Railroad Workers
- Clergy and religious groups
- Private Elementary and Secondary Schools
- Military
- Nonprofit Organizations not in UI
- Students and their spouses working at Universities and colleges
- Elected Officials
- Local and State Government Judiciary
- Interns at Hospitals and Social Service Agencies
- Insurance Agents under Statutory Classification

State and Federal Agencies

Collected by State Workforce Agencies **Job Service North Dakota**

→ Federal-state Covered Employment and Wages (ES-202) Program....... reporting of data is called **Quarterly Census of Employment and Wages (QCEW)**

→ U.S. Department of Labor **Bureau of Labor Statistics (BLS)**

U.S. Department of Commerce **Census Bureau**

U.S. Department of Treasury **Internal Revenue Service**

U.S. Department of Commerce **Bureau of Economic Analysis (BEA)**

BEA's Regional Economic Accounts
► Annual Personal Income and Employment Series
  ► **Total Full-time and Part-time Employment by Industry (SAEMP25)**

Developing Economic Sector Profiles

An industry balance sheet or economic profile is one of the most important elements in economic contribution studies. Nearly all key economic metrics have their origin within an industry's economic profile/sector. Information and data to create economic sector profiles were collected from surveys of industry firms and data from government agencies.

While the IMPLAN modeling platform provides baseline economic profiles generated from proprietary estimation techniques applied to government data, this study relied on state-sourced data and industry input to create a customized IO matrix. The process of developing study-specific economic profiles and then modifying an IO matrix is time consuming and requires considerable empirical analysis, but the results from those efforts produce a credible and transparent evaluation of an industry's role in an economy.
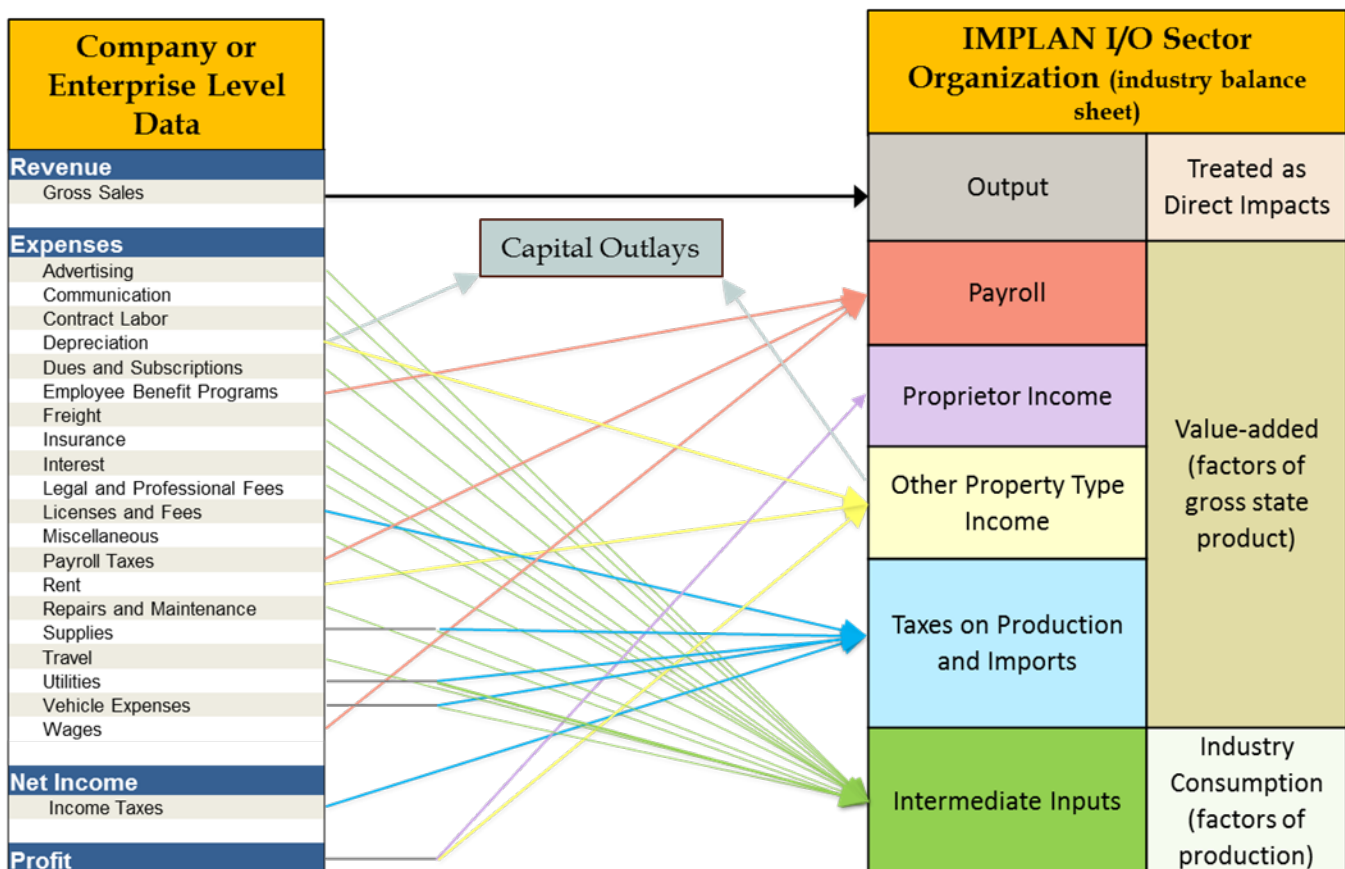
General Transposition of Financial Information into IMPLAN Economic Sector Profiles

Source: DA Bangsund, Department of Agribusiness and Applied Economics, NDSU

Treatment of Traditional Economic Sectors Supporting Lignite Energy Industry

This summary omits specific details of how the secondary economic effects are distributed among the state's numerous economic sectors and sub-sectors. Several economic sectors support the lignite energy industry by providing inputs and services to various segments of the industry. Examples include manufacturing, financial institutions, legal representation, business services, industrial equipment and machinery, among others. Under some definitions, those activities and sectors are presented as "direct" segments of the industry. However, from the perspective of how this study's input-output analysis was structured, those sectors represent "indirect" economic output of the industry, meaning those sectors are supported and sustained from purchases relating to lignite energy industry mining, conversion, and transportation/distribution.

Acknowledgments