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Economic Impact of the Alabama Energy Industry on the Economy of the State of Alabama

Prepared by: M. Keivan Deravi, PhD Professor of Economics Auburn University at Montgomery August 2016 This report attempts to estimate the economic impact of the energy industry of Alabama on the state's economy. The variables of interest to be analyzed are employment, earning, and final demand (output).

At the very best, this economic report is an estimate, which is based on the sound theoretical foundation of the region's economy and the most updated socioeconomic, demographic, retail, and general business climate information available.

This study estimates possible changes to the regional economy predicated on an existing economic operation and does not consider the presence of any externalities, either positive or negative, in its computation.

The premise of this analysis is that there will be no major event to change the short or long term economic foundation of the region, and there will be no other competing investment in the area in the future. In other words, we assume everything else will remain constant, as we run this exercise.

Every attempt has been made to use the most recent information. The author, however, does not assume responsibility for any changes or revisions that may be made to the source data.

M. Keivan Deravi, Ph.D. Professor of Economics Auburn University Montgomery August 2016

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Executive Summary

Purpose

The energy industry is a significant component of the overall economic infrastructure grid and a major contributor to the economic growth.

- While there is documentation regarding the impact of the energy industry on the national economy, there is very limited data at the state level.
- The purpose of this report is to fill that void and to provide an estimate for the economic impact of Alabama's energy sector on the state's economy.

Introduction

- Energy industry can be defined to include the following groups¹:
 - 1. Direct energy production sector which includes oil and gas exploration, extraction, support, and electric power generation.
 - 2. Primary support sector which includes upstream, midstream, and downstream complements to direct energy production and include activities such as manufacturing, transportation, distribution, retail and wholesale fuels and construction.
- For the purpose of this report, we concentrated on the first of the two groups listed above.
- More specifically, we focused on identifying the contribution to the state's economy attributable to the direct energy production sectors which includes oil and gas exploration, extraction, support, and electric power generation.
- This decision was made primarily due to availability of data.

Data

- The majority of data for conducting this report was collected from nationally available databases such as the U.S. Bureau of Economic Analysis (BEA) or the U.S Bureau of Labor Statistics (BLS).
- A small sample of data for Alabama-based utility companies was provided by the Energy Institute of Alabama.
- This report solely concentrated on 2014 and 2015 data.

¹ Tulsa's Energy Industry in 2012: Industry Definition and Economic Impact, Russell R. Evans, Ph.D., Oklahoma City University

Alabama Energy Industry

- Alabama is ranked among the top two-fifths of all states in the United States in every measurable attribute of the energy industry.
- For example, Alabama ranks eighteenth in energy consumption per person due to relatively high demand from Alabama's industrial sector, which consumes more energy than the state's transportation sector and residential sector combined.^{2,3}
- Together, Alabama's residential and commercial sectors account for about one-third of the end-use energy consumption. The transportation sector uses one-fourth of the energy delivered to end users in Alabama, and the industrial sector accounts for more than two-fifths of end-use consumption.^{4,5}
- Coal has been mined in Alabama for more than 150 years, and the state ranks 14th in total coal production among the United States.
- According to the U.S. Energy Department, in 2014, two-thirds of the coal produced in Alabama was exported.
- Mobile, Alabama, is the nation's third-largest seaport for exporting United States coal, most of which is bound for Europe, South America, and Central America.
- Alabama is sixth among the states in electricity generation. Alabama is one of the largest generators of electricity from nuclear power in the nation. Its two nuclear power plants, with a total of five reactors, typically produce about one-fourth of the electricity generated in Alabama.^{6,7,8}

Direct Data

- Direct data are primary drivers for calculating economic impact estimates and a starting point for conducting such studies.
- As of 2015, the energy industry contributed a total of \$9 billion to Alabama's GDP.
- Utilities accounted for 65 percent of total activities and mining was responsible for the remaining 35 percent.

⁶ <u>http://www.eia.gov/state/analysis.cfm?sid=AL</u>

² <u>http://www.eia.gov/state/analysis.cfm?sid=AL</u>

³ U.S. Energy Information Administration, State Energy Consumption Estimates 1960 through 2013, DOE/EIA-0214(2013) (July 2015), Table C13, Energy Consumption per Capita by End-Use Sector, Ranked by State, 2013.

⁴ <u>http://www.eia.gov/state/analysis.cfm?sid=AL</u>

 ⁵ U.S. Energy Information Administration, State Energy Consumption Estimates 1960 through 2013, DOE/EIA-0214(2013) (July 2015), Table C10, Energy Consumption by End-Use Sector, Ranked by State, 2013.

⁷ U.S. Energy Information Administration, Electric Power Monthly (February 2011, 2012, 2013, 2014), Tables 1.6.B, 1.7.B, 1.10B, 1.12.B; (February 2016), Tables 1.3.B, 1.4.B, 1.7.B, 1.9.B.

⁸ U.S. Energy Information Administration, Alabama Nuclear Profile 2010, accessed April 25, 2016

- Together, they accounted for 4.3 percent of the total GDP in Alabama. The share of the energy industry to Alabama GDP stayed constant for the time period of 2013 to 2015.
- This industry provided direct employment for approximately 28,000 Alabamians in 2013 and 2014. This total represents 1.3 percent of nonfarm employment in the state.
- It is important to note that the figures do not include any upstream, midstream, and downstream complements job data to the direct energy industry employment.
- On an annual basis the energy industry's payroll added \$1.9 billion to the state's wages and salaries in 2015. This represented roughly 3 percent of the state's total wages and salaries in 2015.
- The utility firms figure for capital spending also indicates that a total of \$1.4 billion of spending has taken place in 2015 in support of their buildings and machinery needs.
- The impressive investment on capital is expected since the energy industry, in general, and the utility companies, in particular, are known for being highly capital intensive.

Economic Impact

Construction

- Our calculation indicates the total output impact of construction in 2015 was in excess of \$1.1 billion.
- it is our estimate that the construction spending by the utility companies was responsible for approximately 18,800 full time equivalent (FTE) jobs in the state in 2015.

Mining

• Based on our estimate, in 2015, the mining economic impact on Alabama's economy was a net addition of \$3.8 billion in terms of additional GDP, \$1.2 million in additional payroll, and 34,000 FTE jobs.

Utilities

• Based on our estimate, in 2015, the utilities economic impact on the Alabama economy was a net addition of \$8.2 billion in terms of additional GDP, \$3.7 million in additional payroll, and 71,000 FTE jobs.

Total

- It is our estimate that, in 2015, the energy industry's total economic impact on the Alabama economy was a net addition of \$13.2 billion in terms of additional GDP, \$5.6 billion in additional payroll, and 124,000 FTE jobs.
- It is our estimate that, in 2015, Alabama could have experienced an influx of tax revenue equal to \$327 million and \$58 million, in the Education Trust Fund and General Fund, respectively.

Purpose

The American Petroleum Institute (API) estimates that the United States energy industry employs, directly and indirectly, more than 9 million people. This translates to over 5% of the total employment in the United States. According to API, the energy industry supported a total value added to the national economy of more than \$1 trillion, representing 7.7% of United States GDP.⁹

The energy industry is a significant component of the overall economic infrastructure grid and a major contributor to the economic growth. While there is documentation regarding the impact of the energy industry on the national economy, there is very limited data at the state level. The purpose of this report is to fill that void and to provide an estimate for the economic impact of Alabama's energy sector on the state's economy.

Scope of the Study

There is no clear definition of the energy industry. In the purest form, one can define the energy industry to include exploration and production of fuels from oil and natural gas to wind and solar biofuels. In this context, the industry also includes production of electric generation from hydro, coal, and natural gas as well as construction and maintenance of high energy-efficiency transmission systems.¹⁰

Alternatively, an expanded definition of energy industry can also include refining, wholesale and retail distribution, support manufacturing, and business services. In essence, it can be argued that the expanded list of sectors comprising the energy industry can be divided into two groups¹¹:

- 1- Direct energy production sector which includes oil and gas exploration, extraction, support, and electric power generation.
- 2- Primary support sector which includes upstream, midstream, and downstream complements to direct energy production and include activities such as manufacturing, transportation, distribution, retail and wholesale fuels and construction.

For the purpose of this report, we concentrated on the first of the two groups listed above. More specifically, we focused on identifying the contribution to the state's economy attributable to the direct energy production sectors which includes oil and gas exploration,

⁹ Energy for Economic Growth, Energy Vison, Update 2012, Economic Forum

¹⁰ Tulsa's Energy Industry in 2012: Industry Definition and Economic Impact, Russell R. Evans, Ph.D., Oklahoma City University

¹¹ Tulsa's Energy Industry in 2012: Industry Definition and Economic Impact, Russell R. Evans, Ph.D., Oklahoma City University

extraction, support, and electric power generation. This decision was made primarily due to availability of data.

The majority of data for conducting this report was collected from nationally available databases such as the U.S. Bureau of Economic Analysis (BEA) or the U.S Bureau of Labor Statistics (BLS). A small sample of data for Alabama-based utility companies was provided by the Energy Institute of Alabama. This report solely concentrated on 2014 and 2015 data.

Introduction

Alabama Energy Industry - Synopsis and National Ranking¹²

- In 2014, Alabama ranked 17th in the nation in the number of producing natural gas wells.
- Mobile, Alabama, was the third-largest seaport for exporting U.S. coal in 2015. Coking coal used in the steelmaking process, accounted for 83% of total exported coal.
- The three reactors at the Browns Ferry Nuclear Plant in Limestone County, Alabama, have a combined generating capacity of 3,309 megawatts, second in capacity only to Arizona's Palo Verde Nuclear Plant.
- Alabama ranked eighth, in 2015, in net electricity generation from renewable energy resources, including hydroelectric power.
- In 2015, conventional hydroelectric power supplied 75% of Alabama's generation from renewable resources.
- Alabama has the third-largest amount of timberland acreage among the lower 48 states.
- In 2015, Alabama ranked fifth in the nation in electricity generation from biomass, much of it from wood and wood waste from the state's substantial forest products industry.

Table 1: Alabama Energy Industry- U.S. Rankings¹³

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16
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Energy Industry in Alabama

Alabama is ranked among the top two-fifths of all states in the United States in every measurable attribute of the energy industry. For example, Alabama ranks eighteenth in energy consumption per person. This high ranking is due to relatively high demand from Alabama's

¹² www.eia.gov/state/?sid=AL

¹³ www.eia.gov/state/?sid=AL

industrial sector, which consumes more energy than the state's transportation sector and residential sector combined.^{14,15}

Together, Alabama's residential and commercial sectors account for about one-third of the end-use energy consumption. The transportation sector uses one-fourth of the energy delivered to end users in Alabama, and the industrial sector accounts for more than two-fifths of end-use consumption. Together the Alabama end-use sectors account for only three-fifths of the total energy used in the state, and electric power generation consumes the rest.^{16,17}

Coal has been mined in Alabama for more than 150 years, and the state ranks 14th in total coal production among the United States. According to the U.S. Energy Department, in 2014, two-thirds of the coal produced in Alabama was exported. Mobile, Alabama, is the nation's third-largest seaport for exporting United States coal, most of which is bound for Europe, South America, and Central America. In 2015, Mobile also was second only to Tampa, Florida, in coal imports. More than half the coal mined in Alabama for domestic sale is delivered to electric power plants in the state.^{18,19,20,21}

A Congressional act designated the Port of Mobile as an "Energy Transfer Port". Such designation is granted based on meeting the following two criteria: the first is a port, as of 2012, must handle at least 40 million tons of cargo and, second, 25% of cargo must be qualified as an energy commodity. This designation is required for the energy transfer ports to receive additional federal dredging dollars. Such federal funds are then used for maintaining seaport navigation harbors and channels. As part of its maintenance and expansion program and in order to stay competitive, the Port of Mobile relies on tonnage amounts in order to receive federal revenue to service its ship channels.

Alabama is sixth among the states in electricity generation. Historically, coal has fueled the largest share of electric power generation in the state. Recently, however, natural gas has provided a larger share, exceeding coal-fired generation in 2012, 2014, and 2015. Alabama is

¹⁴ <u>http://www.eia.gov/state/analysis.cfm?sid=AL</u>

¹⁵ U.S. Energy Information Administration, State Energy Consumption Estimates 1960 through 2013, DOE/EIA-0214(2013) (July 2015), Table C13, Energy Consumption per Capita by End-Use Sector, Ranked by State, 2013.

¹⁶ <u>http://www.eia.gov/state/analysis.cfm?sid=AL</u>

 ¹⁷ U.S. Energy Information Administration, State Energy Consumption Estimates 1960 through 2013, DOE/EIA-0214(2013) (July 2015), Table C10, Energy Consumption by End-Use Sector, Ranked by State, 2013.

¹⁸ <u>http://www.eia.gov/state/analysis.cfm?sid=AL</u>

 ¹⁹ Geological Survey of Alabama, State Oil and Gas Board, Coal Systems, accessed April 23, 2016
 ²⁰ U.S. Energy Information Administration, Quarterly Coal Report (Abbreviated), October-December 2015 (April 2016) Table 13, U.S. Coal Exports by Customs District.

²¹ U.S. Energy Information Administration, Quarterly Coal Report (Abbreviated), October-December 2015 (April 2016), Table 20, Coal Imports by Customs District.

one of the largest generators of electricity from nuclear power in the nation. Its two nuclear power plants, with a total of five reactors, typically produce about one-fourth of the electricity generated in Alabama.^{22,23,24}

Alabama is one of the largest producers of hydroelectric power in the nation.²⁵ The largest share of retail electricity sales in Alabama is delivered to the industrial sector, followed closely by the residential sector. Average monthly consumption of electricity in Alabama by the residential sector is among the highest in the nation. This has to do mainly with the temperature and humidity during summer, and the fact that three out of five Alabama households heat with electricity during winter. Alabama is a net exporter of electricity. Large amounts of electricity are delivered to neighboring states.²⁶

Economic Impact – Methodology

The methodology employed to estimate the impact of Alabama's energy industry (the industry), on the state's economy, is derived from regional economic models. The basic premise is that the spending by the Industry stimulates various sectors in the economy. First, the transaction activities originated due to the Industry spending increase the demand for goods and services in the local economy. Net, the affected sectors increase their demand from their suppliers throughout the region to respond to the demand for their products.

Classifying the impacts into three broad categories facilitates an understanding of how an initial change on the demand for goods and services, the economy, and due to economic activity, is multiplied into additional impacts.

The three categories of impacts are:

Direct: The direct impact of spending by the Industry is the additional demand and expenditures in the economy that are directly attributable to the regular and day-to-day operation originated by various activities of the Industry.

Indirect: To the extent that direct purchases of goods and services associated with the industry's spending reverberate throughout the economy and result in further increases in business transactions, there will be indirect impacts. An indirect impact, for example, results when a business needs additional construction materials and labor to service the increased demand directly attributable to the operation of the industry. The suppliers of these items find

²² <u>http://www.eia.gov/state/analysis.cfm?sid=AL</u>

²³ U.S. Energy Information Administration, Electric Power Monthly (February 2011, 2012, 2013, 2014), Tables 1.6.B, 1.7.B, 1.10B, 1.12.B; (February 2016), Tables 1.3.B, 1.4.B, 1.7.B, 1.9.B.

²⁴ U.S. Energy Information Administration, Alabama Nuclear Profile 2010, accessed April 25, 2016

²⁵ U.S. Energy Information Administration, Electric Power Monthly (February 2016)

²⁶ <u>http://www.eia.gov/state/analysis.cfm?sid=AL</u>

their sales increasing and, in turn, need more input to meet the new demand. This process continues, yielding a multiplied effect on the output of the state economy. Whenever the extra demands are met by industries outside of the local economy, there are **leakages** from the flow of products and income from the local economy. **The greater the number of leakages, the lower the indirect impacts, and the lower the multiplier**. On the other hand, the more diversified the local economy, the higher the value of multipliers.

Induced: Additional indirect effects are induced by the change in income in the economy. For example, when a business hires an additional worker to meet the demand caused by the industry, the worker's spending further enhances economic activity in the region.

Determining multipliers for the projects under consideration is a fundamental step toward conducting an economic impact analysis. The term multiplier refers to the ratio of all direct, indirect, and induced effects to the direct effects. Once the total direct impact of the Industry's spending is estimated —specifically, earnings, employment, and output directly attributable to— they are linked to other relevant criteria to estimate the pursuant demand on housing, labor force, and any addition to sales tax, property tax, and income tax revenues realized by the state officials.

For the purpose of estimating the economic impact of this project, economic, demographic, and housing market information were gathered from:

The U.S. Department of Labor The U.S. Census Bureau The U.S. Bureau of Economic Analysis Alabama Department of Revenue Economic Development Partnership of Alabama

Notes about Impact (Analysis) Model

The following observations should be noted about the model that has been used for conducting the analysis in this study.

- The Input-Output model used for this study deals with readily available quantifiable impacts such as dollars of spending or employment. The model does not consider social costs or benefits of economic activities.
- The model used is a static process that does not take into effect changes over time in a dynamic economy. This suggests that the relationships between economic sectors are fixed, as of the date of the model's underlying database, and does not account for adjustments that may take place over time.
- The model assumes that the relationship between changes in demand for products and services and the resulting changes in income and employment are linear. That is, it does not take into account the changes in productivity over time.

- The model assumes that a response to any incremental changes in demand for goods and services is at the average rather than the marginal rate.
- Finally, the model does not take into consideration the additional capital expenditures required to support indirect and induced effects on the local economy.

Direct Data

Direct data are primary drivers for calculating economic impact estimates and a starting point for conducting such studies. Direct data for estimating the economic impact of the energy industry in Alabama presented in Tables 2 through 5. As noted earlier, all information is collected from the U.S. Bureau of Economic Analysis (BEA) and the U.S Bureau of Labor Statistics (BLS). A very small sample of data pertaining to utility companies was provided by the Energy Institute of Alabama.

For the purpose of this report, the energy industry in Alabama is defined as all the economic activities that are included in the Mining and Utilities sectors. According to the BEA, "The Mining sector distinguishes two basic activities: mine operation and mining support activities. Mine operation includes establishments operating mines, quarries, or oil and gas wells on their own account or for others on a contract or fee basis. Mining support activities include establishments that perform exploration (except geophysical surveying) and/or other mining services on a contract or fee basis (except mine site preparation and construction of oil/gas pipelines)"²⁷. The Utilities sector is defined as "... establishments engaged in the provision of the following utility services: electric power, natural gas, steam supply, water supply, and sewage removal. Within this sector, the specific activities associated with utility services provided vary by utility: electric power includes generation, transmission, and distribution; natural gas includes distribution; steam supply includes provision and/or distribution; water supply includes treatment and distribution; and sewage removal includes collection, treatment, and disposal of waste through sewer systems and sewage treatment facilities".²⁸

In Table 2, we highlight the output or the production values of Alabama's energy industry. As of 2015, the energy industry contributed a total of \$9 billion to Alabama's GDP. Utilities accounted for 65 percent of total activities and mining was responsible for the remaining 35 percent. Together, they accounted for 4.3 percent of the total GDP in Alabama. The share of the energy industry to Alabama GDP stayed constant for the time period of 2013 to 2015.

²⁷ Bureau of Economic Analysis

²⁸ Bureau of Economic Analysis

Table 2: Energy Industry Production and Alabama Gross Domestic Product²⁹

	2013	2014	2015
Mining	\$3,327,000,000	\$3,261,000,000	\$3,039,000,000
Utilities	\$5,099,000,000	\$5,354,000,000	\$5,750,000,000
Alabama GDP	\$191,605,000,000	\$197,535,000,000	\$204,235,000,000

The employment figures for the Alabama energy industry is presented in Table 3. This industry provided direct employment for approximately 28,000 Alabamians in 2013 and 2014. This total represents 1.3 percent of non-farm employment in the State. It is important to note that the figures do not include any upstream, midstream, and downstream complements job data to the direct energy industry employment.

Table 3: Energy Sector and Alabama Total Non-agricultural Employment³⁰

	2013	2014
Mining, quarrying, and oil and gas extraction	13,662	13,674
Utilities	14,710	14,657
Private non-farm employment	2,085,126	2,115,999

In terms of the industry's wages and salaries, the BEA numbers presented in Table 4, indicate that, on an annual basis, the energy industry's payroll added \$1.9 billion to the state's wages and salaries in 2015. This represented roughly 3 percent of the state's total wages and salaries in 2015.

Table 4: Alabama and Energy Industry Wage and Salaries

	2013	2014	2015
Mining, quarrying, and oil			
and gas extraction	\$622,800,000	\$610,510,000	\$572,128,000
Utilities	\$1,270,923,000	\$1,263,986,000	\$1,419,699,000
Private non-farm wages			
and salaries	\$64,503,641,000	\$66,979,486,000	\$69,557,249,000

²⁹ Bureau of Economic Analysis

³⁰ Bureau of Economic Analysis

Finally, in order to collect direct firm-level data regarding the electrical energy sector's capital spending, and to double check the employment and wages and salaries figures, we asked the Energy Institute of Alabama to provide us with the electrical energy sector companies' employment, salaries and capital spending figure for 2015. These figures are presented in Table 5.

	Number of Employees	Salaries	Capital Spending
Industry Total	13,935	\$1,389,253,494	\$1,441,363,703

Table 5: Alabama's Electrical Energy Setcor - Direct Data, 2015

For 2015, the electrical energy sector data for employment and wages and salaries in Alabama are reported to account for 95 and 98 percent of the total utilities' estimates, respectively. This highigths the weight and heavy share of the electrical sector's employment and payroll on the overall utilities' industry economic attributes.

The electrical energy sector firms' figure for capital spending also indicates that a total of \$1.4 billion of spending has taken place in 2015 in support of their buildings and machinery needs. The impressive investment on capital is expected since the energy industry, in general, and the electrical energy companies, in particular, are known for being highly capital intensive.

Economic Impact

Construction Phase – Utility Companies

As was stated earlier, Alabama's utility companies reported capital spending of \$1.4 billion during 2015. So long as the spending was directed towards buildings and fixed structures or equipment which are built in state, those investments generated a transitory non-recurring economic impact on Alabama's economy.

To prepare the data for the economic impact analysis, first, we assumed only 50 percent of the investment was spent on building and fixed structures. We labeled this sum as the construction budget. Next, we allocated 40% of the construction budget to labor and the remaining 60% to materials. The expenditures on constructional materials spending (non-payroll expendituries) totaled to \$432 million. The labor cost (payroll) of the project is projected to be \$288 million. It is also our estimate that 6,400 construction employees worked on various utility-related construction sites, during 2015, on a full time equivalent (FTE) basis.

The economic impact of the construction phase is estimated as follows:

✓ The first aspect of the economic impact of the construction spending works through the salaries and wages that are paid directly to the workers employed at the site. These

workers will spend their realized income and will, in turn, create taxes and additional income as the multiplier process continues to complete its cycle.

✓ The second aspect of the construction phase works through purchases of construction materials. This expenditure creates direct demand and additional sales revenue for locally-based companies. These additional revenues, following the national income and product mechanism, will trickle throughout the economy in the form of earnings for the firms and the workers who provided the material and services. The additional earnings, so generated, will become purchasing power, which in turn will be spent on the purchase of goods and services. These purchases will create taxes and additional income as the multiplier process works through its cycle.

In Table 6, we show the output impact of the construction-related direct payroll spending on the state's economy. In 2015, the construction spending is estimated to have injected a total of \$288 million of direct wages and salaries in the state's economy. This income (earned income) was spent on the purchase of goods and services (output) throughout the Alabama economy.

More specifically, the calculation was carried out as follows:

- ✓ First, spending leakages (30%) are subtracted from the gross payroll. This provides us with "contributory direct payroll".
- ✓ Next, the output multiplier for payroll spending is 1.897.
- ✓ Finally, applying this multiplier to the contributory direct payroll yields an output impact contribution from payroll of \$383 million for the gross payroll of the construction phase.

Next, we concentrated on the output contribution from non-payroll expenditures. In addition to the payroll spending, construction companies also purchase materials and services in support of their operation. This includes, to name a few, purchases of heavy machinery, construction materials, and office supplies. This non-payroll spending, in turn, will boost sales and revenues for the local suppliers of such products and services and also supports additional employment. The output impact of this category of spending is in the lower section of Table 6.

As presented in Table 6, the construction's non-payroll expenditure, in 2015, was estimated to total \$432 million. This figure is estimated by subtracting the payroll expenditure from the construction's value in place (added contribution to the state's GDP). We applied a leakage factor of 20% in order to estimate the in-state portion of construction spending. Finally, we applied a multiplier of 2.1653 to this class of spending. This resulted in an estimate of output impact from non-payroll expenditures of \$749 million.

The total output impact of the construction phase by the utility companies on the State's economy is the sum of these two subcomponents. Our calculation indicates the total output impact of construction in 2015 was in excess of \$1.1 billion.

Table 6: Energy Industry Output Impact – Construction

Subset Industry Gross Payroll	\$288,272,741
Withholding	
Leakages	\$86,481,822
Contributory Direct Payroll	\$201,790,918
Weighted Average Payroll Multiplier	1.897
Economic Impact Contribution from Payroll	\$382,797,372
Subset Industry Value Put in Place	\$720,681,851
Subset Industry Payroll	\$288,272,741
Subset Industry Non-Payroll Expenditure	\$432,409,111
Laskaga	¢96 491 933 16
Leakage	\$80,481,822.10
I otal in-State Non-Payroll Expenditures	\$345,927,289
Multiplier	2.1653
Total Economic Contribution from Non-Payroll Expenditures	\$749,036,358
Total Economic Contribution- Construction	\$1,131,833,730

Next, we focused on the employment impact. Similar to the output case, we computed the employment impact using both the payroll and non-payroll spending. It is important to note that these two classifications of spending have their own distinct multipliers. The exact process and results are in Table 7. As reported, it is our estimate the construction spending by the utility companies was responsible for approximately 18,800 full time equivalent (FTE) jobs in the state in 2015.

Table 7: Energy Industry Employment Impact – Construction

Total In-State Non-Payroll Expenditures	\$345,927,289
Employment Multiplier	20.29
Added Jobs	6,668
Direct Job - Construction	6,406
Direct Employment Multiplier	1.9034
Jobs Created	12,193
Total Employment Impact	18,861

Energy Industry

We estimated the total economic impact of Alabama's energy industry on the state economy using the change in final demand approach. Theoretically, industry's expenditures on operations and maintenance and its payroll create additional demand for goods and services in the region. This change in final demand reverberates throughout the economy and creates yet additional secondary economic benefits in the region.

We used the U.S. Bureau of Economic Analysis (BEA) estimates of output or production as the proxy for total annual value-added. This estimate was then converted as a proxy for the potential change in the final demand attributable to the energy industry. We then discounted this estimate by 20% to allow for any potential leakages from the state's economy. This estimated proxy for the change in the final demand was subsequently used in our economic input-output model.

The model utilizes a matrix of 38 by 489 sector multipliers to map the economic impact of a change in final demand on the entire economy of any region in the state. The economic impact model used in this report is developed by the author of this report for the State of Alabama. This model is specific to the state and has been used in estimating the economic impact of all the mega industrial projects recently located in Alabama. This includes, Mercedes, Honda, Hyundai, ThyssenKrupp Steel, and Northrop and Grumman. The model uses the multipliers estimated by RIMS II. The results of our model simulation are tabulated and presented in Tables 8 through 11.

As was noted earlier, we focused on identifying the contribution to the State's economy attributable to the direct energy production sectors which includes oil and gas exploration, extraction, support, and electric power generation. Given the fact that the two sub-sectors of the energy industry have different set of multipliers, we ran our model twice and each was based on different set of direct data. Our economic model was first simulated using mining as the driver with that sector's direct impact estimates. Next, the model was crunched with the direct estimates for the utilities sub-sector.

In Table 8, we report the total economic impact of themining sub-sector on the state's economy. Based on our estimate, in 2015, the mining economic impact on Alabama's economy were a net addition of \$3.8 billion in terms of additional GDP, \$1.2 million in additional payroll, and 34,000 FTE jobs.

	Output	Earning	Employment
Direct Impact	\$3,039,000,000	\$572,128,000	13,674
State - Economic Impact	\$3,851,993,280	\$1,177,488,160	33,935
State - Multiplier	1.267	2.058	2.481

Table 8: Economic Impact of Mining

In Table 9, we show the distribution of the projected economic impact across the Alabama's industrial grid. The mining sub-sector is projected to be the largest beneficiary, followed with finance and insurance, services, transportation and utilities, and manufacturing.

	Output	Earning	Employment
Agriculture, forestry, and fisheries	0%	0%	0%
Mining	65%	78%	69%
Construction	1%	2%	3%
Manufacturing	4%	3%	3%
Transportation, communication, and utilities	5%	3%	2%
Wholesale and retail trade	3%	4%	6%
Finance, insurance, and real estate	14%	2%	3%
Services	6%	9%	14%
Total	100%	100%	100%

Table 9: Industry-by-Industry Economic Impact, Mining

Next, same exercise and process was repeated for the utilities sub-sectors. The results are outlined in Tables 10 and 11.

In Table 10, we report the total economic impact of the utilities sub-sector on the state's economy. Based on our estimate, in 2015, the utilities economic impact on Alabama economy were a net addition of \$8.2 billion in terms of additional GDP, \$3.7 billion in additional payroll, and 71,000 FTE jobs.

Table 10: Economic Impact, Utilities

	Output	Earning	Employment
Direct Impact	\$5,750,000,000	\$1,419,699,000	14,657
State - Economic Impact	\$8,243,200,000	\$3,698,388,100	71,038
State - Multiplier	1.4336	1.4336	1.4336

Similar to the mining case, in Table 10, we show the distribution of the projected utilities economic impact across the Alabama's industrial grid. The utilities sub-sector is projected to have received the largest benefit followed by services, finance and insurance, mining, construction and manufacturing.

Table 11: Industry-by-Industry Economic Impact, Utilities

	Output	Earning	Employment
Agriculture, Forestry, and Fisheries	0%	0%	1%
Mining	6%	3%	3%
Construction	5%	4%	8%
Manufacturing	5%	2%	4%
Transportation, Communication, and Utilities	64%	76%	49%
Wholesale and Retail Trade	4%	3%	9%
Finance, Insurance, and Real Estate	6%	2%	4%
Services	9%	9%	21%
Total	100%	100%	100%

Economic Impact- Total

Total or aggregated economic impact of the Alabama's energy industry is presented in Table 12. Total economic impact is defined as the summation of the impacts attributable to construction, mining, and utilities activities. It is our estimate that, in 2015, the energy industry's total economic impact on the Alabama economy was a net addition of \$13.2 billion in terms of additional GDP, \$5.6 billion in additional payroll, and 124,000 FTE jobs. We also used our model to estimate the fiscal impact of the energy industry on Alabama's total tax receipts. It is our estimate that, in 2015, Alabama could have experienced an influx of tax revenue equal to \$327 million and \$58 million, in the Education Trust Fund and General Fund, respectively.

Table 12: Total Economic Impact, Energy Industry and Construction, 2015

	Output	Earning	Employment	ETF	GF
Energy	\$3,851,993,280	\$1,177,488,160	33,935	\$69,366,974	\$12,255,268
Utility	\$8,243,200,000	\$3,698,388,100	71,038	\$217,875,643	\$38,492,733
Construction	\$1,131,833,730	\$679,100,238	18,861	\$40,006,456	\$7,068,059
Total	\$13,227,027,010	\$5,554,976,498	123,834	\$327,249,073	\$57,816,059