

Economic Impact Study of the Proposed Grain Belt Express Clean Line Project

June 10, 2013



Photo by Jeff Cowell of Wichita, Kansas

Prepared For: Grain Belt Express Clean Line LLC

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Executive Summary

Grain Belt Express Clean Line LLC (“Clean Line”) is proposing to build the Grain Belt Express Clean Line, an approximately 700-mile, high voltage direct current transmission line that will connect wind resources in Kansas with energy demand centers in Missouri, Illinois, Indiana and states farther east. The construction of the proposed transmission line is expected to stimulate the construction of approximately 4,000 MW of additional wind farms in Kansas. This report summarizes the estimated impacts¹ of both the transmission line and the additional wind generation capacity.

We estimate that the construction of the Grain Belt Express Clean Line itself will – when we include the manufacturing of inputs to the line such as structures, wire, and real estate services – result in the creation of approximately 2,340 jobs per year for three years in Kansas, approximately 1,315 jobs per year for three years in Missouri, approximately 1,450 jobs per year for three years in Illinois, and approximately 38 jobs per year for three years in Indiana. In addition, the Grain Belt Express Clean Line will result in the creation of an estimated 296 permanent jobs stemming from operations and maintenance of the line, including 135 jobs in Kansas, 70 jobs in Missouri, 88 jobs in Illinois, and 3 jobs in Indiana. Fiscal impacts would also be substantial. During the three-year construction phase, individual income tax receipts, corporate income tax receipts, and sale tax receipts could average a combined total of \$6.76 million per year in Kansas, \$3.74 million per year in Missouri, \$3.93 million per year in Illinois, and \$74 thousand per year in Indiana.

Regarding the new wind farms that would serve the line, we estimate that the Grain Belt Express Clean Line could support as many as 33,618 manufacturing supply chain jobs in Kansas, Missouri, Illinois and Indiana (“the four-state region”) during the construction phase and would result in the creation of approximately 528 permanent operations and maintenance jobs at those associated wind farms in Kansas. At the national level, economic impacts resulting from the construction of 4,000 MW of new wind generation capacity would include approximately 71,075 jobs during the construction phase and 3,360 jobs annually during the operating years.

Economic Impacts of Construction of the Grain Belt Express Clean Line

Construction

As seen in Table ES-1, when assuming 50 percent of manufacturing (structures and wire) and 100 percent of construction-related activities for the transmission line are completed by in-state firms in the four-state region, the potential total employment impact over the projected period would amount to approximately 5,143 jobs per year for three years. Projected income impacts are substantial as well; the total labor income impact over the projected period would amount to approximately \$311.5 million per year for three years.

Table ES-1: Estimated Annual¹ Impacts of Construction of the Grain Belt Express Clean Line in 4-State Region

	Kansas	Missouri	Illinois	Indiana
Change in Final Demand²	\$220.4	\$118.1	\$140.1	\$3.3
Employment³	2,340	1,315	1,450	38
Labor Income	\$131.5	\$77.0	\$100.8	\$2.2
Output	\$371.0	\$206.0	\$251.1	\$5.7

1. Construction period = 3 years.

2. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

3. All employment figures are full time equivalents.

¹ The impacts of construction and operation of the transmission line, including fiscal impacts—personal and corporate tax revenues—for Kansas, Missouri, Illinois, and Indiana presented here were estimated using the IMPLAN model. The labor, turbine, and supply chain impacts of construction and operation of the new wind farms that could result from construction of the proposed transmission line were estimated using the JEDI model.

Operation and Maintenance (O&M)

Clean Line estimates that annual operation and maintenance (O&M) costs, which will be incurred when the line is up and running, will amount to approximately one percent of total construction costs. In Kansas, this will

result in \$10.0 million in O&M expenditures each year. The corresponding amounts for Missouri, Illinois, and Indiana are \$5.0 million, \$7.0 million, and \$0.2 million, respectively. As shown in Table ES-2, the total impacts of annual O&M expenditures in the four-state region are substantial. The potential total employment impact over the projected period would amount to approximately 296 jobs per year. The total labor income impact over the projected period would amount to approximately \$18 million per year

Table ES-2: Estimated Annual O&M-Related Impacts of the Grain Belt Express Clean Line in 4-State Region

	Kansas	Missouri	Illinois	Indiana
Employment¹	135	70	88	3
Labor Income²	\$7.6	\$4.1	\$6.1	\$0.19
Output	\$17.7	\$9.2	\$13.1	\$0.43

1. All employment figures are full time equivalents.
2. All monetary impacts are in millions of 2013 \$ and are rounded.

Fiscal Impacts of the Grain Belt Express Clean Line

The IMPLAN model was used to estimate certain tax-related impacts of the projected increases in final demand in Kansas, Missouri, Illinois and Indiana. The tax impacts considered here

include individual income tax, corporate income tax, and sales tax receipts. Referring to Table ES-3, it is estimated that in Kansas individual income tax receipts, corporate income tax receipts, and sale tax receipts could average a combined total of \$6.76 million per year over the three-year construction period. In Missouri, Illinois, and Indiana the corresponding amounts are \$3.74 million, \$3.93 million, and \$74 thousand per year over the three-year construction period.

Table ES-3: Estimated Fiscal Impacts of Construction of Grain Belt Express Clean Line in 4-State Region

	Kansas	Missouri	Illinois	Indiana
Individual Income Tax¹	\$8.47	\$4.19	\$4.18	\$0.143
Corporate Income Tax	\$1.17	\$0.28	\$1.12	\$0.015
Sales Tax	\$10.64	\$6.75	\$6.48	\$0.063
Total	\$20.28	\$11.22	\$11.78	\$0.221
Annual Average²	\$6.76	\$3.74	\$3.93	\$0.074

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. Construction period = 3 years.

As was previously noted, once the transmission line is built and is in operation, O&M costs will contribute additional spending to the Kansas, Missouri, Illinois, and Indiana economies each year. Referring to Table ES-4, in Kansas individual income tax

receipts, corporate income tax receipts, and sale tax receipts resulting from O&M expenditures are predicted to amount to approximately \$379 thousand per year. In Missouri, Illinois, and Indiana the same revenue sources are predicted to yield approximately \$189 thousand, \$247 thousand, and \$9 thousand per year, respectively.

Table ES-4: Summary of Estimated Annual Fiscal Impacts of O&M Expenditures

	Kansas	Missouri	Illinois	Indiana
Individual Income Tax¹	\$0.162	\$0.074	\$0.084	\$0.004
Corporate Income Tax	\$0.016	\$0.004	\$0.017	\$0.000
Sales Tax	\$0.201	\$0.111	\$0.146	\$0.005
Total	\$0.379	\$0.189	\$0.247	\$0.009

1. All monetary impacts are in millions of 2013 \$ and are rounded.

Economic Impacts of Additional Wind Generation Capacity

The construction of the Grain Belt Express Clean Line is expected to stimulate the development of approximately 4,000 MW of wind farms in Kansas. In order to model the economic impacts, it is assumed that the transmission line will connect eight new 500 MW wind farms to the transmission grid. All eight of the new wind farms will be located in Kansas. The JEDI model, which was used to estimate the economic impacts of the wind farms, contains default values for how these construction and operations and maintenance costs are allocated to the component parts. These default values, however, were not used to estimate the local content of the manufacture of the larger components of a wind turbine – the nacelle, tower, blades, and transportation. Instead, we based the allocation on the American Wind Energy

Association U.S. Wind Industry Annual Market Report 2012 conclusion that the domestic content of wind farms built in the United States rose to 67 percent at the end of 2011. Using 67 percent domestic content as a guideline, we estimated that 55 percent of the nacelles, 90 percent of the blades, and 90 percent of the structures used to construct wind farms would be manufactured in the United States.²

The assumed increase in wind development will yield economic benefits throughout the four-state region as a result of both direct expenditures on the construction of the wind farms and supply chain impacts resulting from the increased demand for the required inputs. To estimate the state-level economic impacts of the new wind generation capacity it was necessary to estimate the percentage of the wind turbine components that would be produced in each state. We constructed two different scenarios in which the four-state region provides either 30 percent or 90 percent of the domestic content. In each scenario, Kansas is assumed to provide half of the major wind turbine parts if the state is home to a current manufacturer of that component. The exact percentages by state and by component are reported in Table 4.5 on page 32.

Kansas

The total economic impact of the wind farms for the state of Kansas consists of two parts – (1) the economic impacts of the direct expenditures made in the state to build the 4,000 MW of wind farms located there, and (2) the supply chain impacts of

Table ES-5: Economic Impacts of Wind Farm Construction and Operation in Kansas

	Employment ¹	Earnings ²	Output
Construction: 30% Scenario	15,542	\$778.8	\$2,283.5
Construction: 90% Scenario	19,656	\$1,026.1	\$3,267.7
Annual Operations: All Scenarios	528	\$25.0	\$73.3

1. All employment figures are full time equivalents.
2. All monetary impacts are in millions of 2013 \$ and are rounded.

the total 4,000 MW of wind farms that will be built in Kansas. Table ES-5 shows the total economic impact during the construction period in Kansas under the 30 percent and 90 percent scenarios. The total employment impacts during construction range from 15,542 to 19,656 jobs, and earnings range between \$778.8 million and \$1.026 billion. It is estimated that when the wind farms built in Kansas are up and running, they will generate 528 jobs and \$25 million in earnings annually.

Missouri

The total economic impacts in Missouri of the wind farms constructed in Kansas include supply chain impacts and associated indirect effects. Table ES-6 shows the total economic impact during the construction period in Missouri under the 30 percent and 90 percent scenarios. The total employment impacts during construction range from 1,311 to 3,933 jobs, and earnings range between \$79.8 million and \$239.5 million under the 30 percent and 90 percent scenarios, respectively.

Table ES-6: Economic Impacts of Wind Farm Construction in Missouri

	Employment ¹	Earnings ²	Output
30% Scenario	1,311	\$79.8	\$329.0
90% Scenario	3,933	\$239.5	\$986.9

1. All employment figures are full time equivalents.
2. All monetary impacts are in millions of 2013 \$ and are rounded.

Illinois

The total economic impacts in Illinois of the wind farms constructed in Kansas include supply chain impacts and associated indirect effects. Table ES-7 shows the total economic impact during the construction period in Illinois under the 30 percent and 90 percent scenarios. The total

Table ES-7: Economic Impacts of Wind Farm Construction in Illinois

	Employment ¹	Earnings ²	Output
30% Scenario	1,471	\$104.0	\$381.1
90% Scenario	4,412	\$311.9	\$1,143.4

1. All employment figures are full time equivalents.
2. All monetary impacts are in millions of 2013 \$ and are rounded.

² See p.30 for a more detailed discussion of the estimation process that was used.

employment impacts during construction range from 1,471 to 4,412 jobs, and earnings range between \$104.0 million and \$311.9 million under the 30 percent and 90 percent scenarios, respectively.

Indiana

The total economic impacts in Indiana of the wind farms constructed in Kansas include supply chain impacts and associated indirect effects. Table ES-8 shows the total economic impact during the construction period in Indiana under the 30 percent and 90 percent scenarios.

Table ES-8: Economic Impacts of Wind Farm Construction in Indiana

	Employment ¹	Earnings ²	Output
30% Scenario	1,872	\$113.5	\$472.5
90% Scenario	5,617	\$340.6	\$1,417.5

1. All employment figures are full time equivalents.
2. All monetary impacts are in millions of 2013 \$ and are rounded.

The total employment impacts during construction range from 1,872 to 5,617 jobs, and earnings range between \$113.5 million and \$340.6 million under the 30 percent and 90 percent scenarios, respectively.

United States

The total economic impact of the wind farms for the United States consist of two parts – (1) the economic benefit of the direct expenditures made in Kansas to build the 4,000 MW of wind farms, and (2) the supply chain impacts. Table ES-9 shows the

Table ES-9: Economic Impacts of Wind Farm Construction and Operation in the United States

	Employment ¹	Earnings ²	Output
Total Construction Impact	71,075	\$4,421.7	\$15,160.5
Total Annual Operating Impacts: All Scenarios	3,360	\$190.7	\$981.4

1. All employment figures are full time equivalents.
2. All monetary impacts are in millions of 2013 \$ and are rounded.

total economic impact during the construction period in the United States assuming 55 percent of the nacelles, 90 percent of the blades, and 90 percent of the structures used to construct wind farms are manufactured in the United States. The total employment impacts during construction amount to 71,105 jobs; earnings increase by \$4.4 billion. It is estimated that when the wind farms built are up and running, they will generate 3,360 U.S. jobs and \$191 million in earnings annually.

1 Background

Grain Belt Express Clean Line LLC (“Clean Line”) is proposing to build the Grain Belt Express Clean Line, an approximately 700-mile, high voltage direct current transmission line that will connect approximately 4,000 MW of wind generation in Kansas with energy demand centers in Missouri, Illinois, Indiana and states east. This report summarizes the estimated economic impacts of the Grain Belt Express Clean Line, including both the impacts of construction and operation of the transmission line and manufacturing of inputs to the line – e.g., structures, wire, real estate services – and the impacts of construction and operation of the wind farms this transmission line would enable.

Transmission Line Impacts

The impacts of construction and operation of the transmission line were modeled using the IMPLAN model.³ The specific impacts analyzed include direct, indirect, and induced effects on employment, income, and output, as well as fiscal impacts – personal and corporate tax revenues and sales tax receipts – for Kansas, Missouri, Illinois, and Indiana. All impacts are reported at the state level for Kansas, Missouri, Illinois, and Indiana. In addition, national estimates of the employment, income, and output impacts of increased spending in the four-state region are reported. All estimated impacts are based on cost of construction and cost of operation and maintenance estimates provided by Clean Line.

Wind Farm Impacts

The construction of the proposed transmission line is also expected to stimulate the construction of additional wind farms in Kansas. The impacts of construction and operation of these new wind farms were estimated using the JEDI model⁴, and include direct, indirect, and induced effects for both Kansas and Illinois. All impacts are reported at the state level for Kansas, Missouri, Illinois, and Indiana. All estimated impacts are based on estimates of the number of new wind farms, location (state) of each wind farm, number of turbines, and size of turbines (MW) provided by Clean Line Energy Partners. Wind farm cost estimates for the construction costs and operation and maintenance costs were based on the JEDI model estimates. The local share of turbines, component parts, materials and personnel were based on JEDI model estimates and information provided by Clean Line.

1.1 Limitations of the Study

It is also important to note what the analysis of the impacts of construction and operation of the transmission line and new wind farms does not include, specifically,

- The *net effects* of the proposed project, i.e., the potential impacts on existing power generation facilities resulting from the development of the wind farms associated with the Grain Belt Express Clean Line;
- The economic costs of any pass-through rates or taxes that electric customers could be required to pay by utility companies purchasing energy from the Grain Belt Express Clean Line or the proposed wind farms;
- Any environmental impacts, costs, or benefits;
- The potential impacts on electric prices and generation costs or fuel prices;
- The potential impacts of regulations associated with renewable energy, and

³ IMPLAN is a PC-based program that allows construction of regional input-output models for areas as small as a county. The model allows aggregation of individual county databases for multicounty analysis. IMPLAN was originally developed for the US Department of Agriculture and is maintained and supported by the Minnesota IMPLAN Group, Inc. Stillwater, Minnesota. IMPLAN is a widely recognized and respected tool for economic impact analysis.

⁴ The JEDI model was developed by Marshall Goldberg, Ph.D. for the National Renewable Energy Laboratory and calculates the number of jobs and the amount of money spent on salaries and economic activities generated in a specific location from the construction and operation of a wind power plant. Because the JEDI model is based upon the IMPLAN model multipliers, the two methods of analysis are compatible. The JEDI model is used by most modelers of wind farm economic impacts.

- The *net effects* of increased demand for the components of the transmission line, construction of the line, operation and maintenance expenditures, and the construction and operations of new wind farms on employment, income, and output in the affected regions.

2 Methodology

The impacts of construction and operation of the transmission line were estimated using the IMPLAN model. The specific impacts analyzed include direct, indirect, and induced effects on employment, labor income, and output, as well as fiscal impacts – personal and corporate tax revenues and sales tax receipts – for Kansas, Missouri, Illinois, and Indiana. The construction of the proposed transmission line is also expected to stimulate the construction of additional wind farms in Kansas. The impacts of construction and operation of these new wind farms were estimated using the JEDI model, and include direct, indirect, and induced effects for the four-state region.

2.1 IMPLAN

The economic impacts of the manufacture of the required components, construction of the line, and operation and maintenance expenses were estimated using the IMPLAN model and 2011 data for Kansas, Missouri, Illinois, and Indiana. Stated briefly, the model is used to estimate the total impacts of an increase in spending in a particular industry. IMPLAN is a micro-computer-based program that allows construction of regional input-output models for areas ranging in size from a single zip code region to the entire United States. The model allows aggregation of individual regional, e.g., county, databases for multi-region analysis.

Total impacts are calculated as the sum of direct, indirect, and induced effects. *Direct effects* are production changes associated with the immediate effects of final demand changes, such as an increase in spending for the manufacture of new structures that will be used to support a new transmission line. *Indirect effects* are production changes in backward-linked industries caused by the changing input needs of the directly affected industry, e.g., additional purchases to produce additional output such as the steel used in the construction of the new transmission structures. *Induced effects* are the changes in regional household spending patterns caused by changes in household income generated from the direct and indirect effects. An example of the latter is the increased spending of the incomes earned by newly hired steel workers.

The analysis summarized here focuses on the impacts of increased manufacturing of the different components of the transmission line, as well as construction of the line, on employment, employee compensation, and total expenditures (output). Employment includes total wage and salary employees as well as self-employed jobs in the region of interest. All of the employment figures reported here are full-time equivalents⁵ (FTE). Employee compensation represents income, including benefits, paid to workers by employers, as well as income earned by sole proprietors. Total output represents sales (including additions to inventory), i.e., it is a measure of the value of output produced. Impacts are estimated on a state-wide basis for Kansas, Missouri, Illinois, and Indiana, as well as for the United States as a whole.

2.2 JEDI

The economic analysis of wind power development presented here utilizes the National Renewable Energy Laboratory's (NREL's) latest (release number W1.10.03) Jobs and Economic Development Impacts (JEDI) Wind Energy Model. The JEDI Wind Energy Model is an input-output model that measures the spending patterns and location-specific economic structures that reflect expenditures supporting varying levels of employment, income, and output. For example, JEDI reveals how purchases

⁵ IMPLAN jobs include all full-time, part time, and temporary positions. When employment is counted as full and part-time, one cannot tell from the data the number of hours worked or the proportion that is full or part-time. A full-time-employed (FTE) worker is assumed to work 2,080 hours (= 52 weeks x 40 hours/week) in a standard year. Employment impacts have been rescaled to reflect the change in the number of FTEs.

of wind project materials not only benefit local turbine manufacturers but also the local industries that supply the concrete, rebar, and other materials. The JEDI model uses construction cost data, operating cost data, and data relating to the percentage of goods and services acquired in the state to calculate jobs, earnings, and economic activities that are associated with this information. The results are broken down into the construction period and the operation period of the wind project. Within each period, impacts are further divided into direct, indirect, and induced impacts.

Direct impacts during the construction period refer to the changes that occur in the onsite construction industries in which the direct final demand (i.e., spending on construction labor and services) change is made. The initial spending on the construction and operation of the wind farm creates a second layer of “indirect” impacts. *Indirect impacts* during the construction period consist of the changes in inter-industry purchases resulting from the direct final demand changes, and include construction spending on materials and wind farm equipment and other purchases of goods and offsite services. Concrete that is used in turbine foundations increases the demand for gravel, sand, and cement. Turbine parts/component manufacturers such as bearing producers, steel producers, and gear producers are also in this same category. Indirect impacts during operating years refer to the changes in inter-industry purchases resulting from the direct final demand changes. All land lease payments and property taxes show up in the operating-years portion of the results because these payments do not support the day-to-day operations and maintenance of the wind farm but instead are more of a latent effect that results from the wind farm being present. *Induced impacts* during construction refer to the changes that occur in household spending as household income increases or decreases as a result of the direct and indirect effects of final demand changes. Induced impacts during operating years refer to the changes that occur in household spending as household income increases or decreases as a result of the direct and indirect effects from final demand changes.

3 Economic Impacts of the Grain Belt Express Clean Line

3.1 Relevant Economic Sectors

In this section we describe the sectors in which direct spending will increase as a result of construction of the proposed transmission line. These sectors include those engaged in the manufacture of structures and wire, those engaged in the actual construction of the transmission line and the installation of converters, the real estate sector, and financial and architectural services.

Clean Line estimates that purchasing the necessary inputs (e.g., structures, wire, and converters) and construction of the proposed transmission line will cost approximately \$2.2 billion. Expenditures are expected to be spread roughly evenly over a three-year period. Table 3.1 summarizes the estimated costs of each of the major components of the line – structures, wire, and converters – as well as the costs of constructing the line, including the cost of acquiring the right-of-way for the line’s location and expenditures on financial and architectural services and electric power. While construction of the line constitutes the single largest component of the total cost (32.5 percent), the costs of manufacturing the structures and wire and installation of the converters are significant as well.

Table 3.1: Distribution of Transmission Line Construction Expenditures by IMPLAN Sector

Component	IMPLAN Sector #	IMPLAN Sector Title	Direct Spending ¹	Percent of Total Expenditures
Installation of Structures	36	Construction of other new nonresidential structures	\$723.1	32.5%
Manufacture of Structures	186	Plate work and fabricated structural product manufacturing	\$381.2	17.1%
Manufacture of Wire	272	Communication and energy wire and cable manufacturing	\$211.0	9.5%
Architectural Services	369	Architectural, engineering, and related services	\$74.5	3.3%
Right of Way	360	Real estate	\$75.2	3.4%
Financial	359	Funds, trusts, and other financial vehicles	\$24.6	1.1%
Electric Power	31	Electric power generation, transmission, and distribution	\$14.4	0.6%
Manufacture of Transformer	244	Electronic capacitor, resistor, coil, transformer, and other inductor manufacturing	\$13.4	0.6%
Installation of Converter/Transformer	36	Construction of other nonresidential structures	\$237.6	10.7%
Converters ²			\$469.0	21.1%
Total			\$2,224.0	100%

1. All spending is in millions of 2013 \$ and rounded.

2. Because the converters are produced overseas, IMPLAN sector information is not relevant, i.e., there are no domestic impacts from construction of the converters.

As indicated in the notes accompanying Table 3.1, the project’s converters will be produced overseas. It is therefore not appropriate to include the actual purchase price of the converters in the estimate of economic impacts that are reported here. The installation of converters in Kansas, Missouri, and Illinois, as well as a transformer in Indiana, however, does constitute increased spending in each of the four states and is therefore appropriately included when estimating the impacts of spending on the proposed line.⁶

⁶ The economic impact study assumes all structures and conductor are manufactured domestically. The United States does have substantial capacity to manufacture structures and conductor. However, increasing investment in electric transmission in the United States raises the possibility that some companies may not have the ability to fulfill demand for some equipment, especially structures. The study does not address this scenario, as Clean Line will first seek to purchase from domestic manufacturers where possible.

Table 3.2 includes information from Table 3.1 and summarizes the allocation of the input and construction costs among the four states. The allocation of construction costs among the four-state region and the inputs to the transmission line reflects several important assumptions. First, it is assumed that costs will vary across states based on the percentage of total line length located in each state. Second, it is assumed that 50 percent of the costs of manufacturing the structures and wire required for the portion of line constructed in each state will be incurred in-state, while the remaining 50 percent of those costs will be incurred elsewhere in the United States (and outside of the four-state region). The 50 percent limitation reflects the fact that productive capacity in each of the affected sectors is much more constrained at the state level than it is at the national level. It is intended to avoid overstating the potential employment, income, and output impacts attributable to manufacturing-related activities in each of the four states where the proposed line would be built. Third, it is assumed that the cost of manufacturing the transformer that will be installed in Indiana will be incurred outside of the four-state region.

Table 3.2: Grain Belt Express Clean Line Inputs for IMPLAN

Component	IMPLAN Sector	Direct Spending ¹	Construction Budget				United States
			Kansas	Missouri	Illinois	Indiana	
Construction							
Installation of Structures	36	\$723.1	\$336.6	\$192.3	\$192.3	\$1.9	\$723.1
Manufacture of Structures ²	186	\$381.2	\$88.7	\$50.7	\$50.7	\$0.5	\$381.2
Manufacture of Wire ²	272	\$211.0	\$49.1	\$28.1	\$28.1	\$0.3	\$211.0
Architectural Services	369	\$74.5	\$34.7	\$19.8	\$19.8	\$0.2	\$74.5
Right of Way	360	\$75.2	\$35.0	\$20.0	\$20.0	\$0.2	\$75.2
Financial	359	\$24.6	\$11.4	\$6.5	\$6.5	\$0.1	\$24.6
Electric Power	31	\$14.4	\$6.7	\$3.8	\$3.8	\$0.0	\$14.4
Manufacture of Transformer	244	\$13.4	\$0.0	\$0.0	\$0.0	\$0.0	\$13.4
Installation of Converters/ Transformers	36	\$237.6	\$99.0	\$33.0	\$99.0	\$6.6	\$237.6
Subtotal		\$1,755.0	\$661.2	\$354.2	\$420.2	\$9.8	\$1,755.0
Converters		\$469.0	\$201.0	\$67.0	\$201.0	\$13.4	\$0.0
Total Cost of Construction		\$2,224.0	\$862.2	\$421.2	\$621.2	\$23.2	\$1,755.0
Average Annual O&M	39	\$22.2	\$10.0	\$5.0	\$7.0	\$0.2	\$22.2

1. All spending is in millions of 2013 \$ and rounded.

2. Assumes 50 percent in-state share of manufacturing.

According to Clean Line's estimates, excluding the cost of the converters (which will be purchased overseas), the total costs of building the proposed line, \$1,755 million, are distributed among the four states and the remainder of the United States as follows: approximately \$661.2 million (37.7 percent) in Kansas, \$354.2 million (20.2 percent) in Missouri, \$420.2 million (23.9 percent) in Illinois, and \$9.8 million (0.6 percent) in Indiana. The remaining \$309.6 million (17.6 percent) of spending, which consists of 50 percent of the spending on the manufacture of the structures and wire and 100 percent of the costs of a transformer, will be incurred outside the four-state region. It is assumed that annual Operation and Maintenance (O&M) expenses (incurred when the line is up and running) will amount to approximately 1 percent of the total costs of construction, including in-state manufacturing and construction costs, manufacturing costs incurred outside the four-state region, and the cost of the converter or transformer installed in each state. Estimated annual O&M costs incurred in each state are shown in the last row of Table 3.2.

3.2 Manufacturing and Construction Impacts at the State Level

To estimate the economic impacts of construction of the transmission line, changes in final demand (i.e., the projected increase in total spending attributable to the manufacture and construction of the proposed transmission line) in each of the relevant sectors were analyzed using the IMPLAN model. Impacts were then aggregated across the different components and types of impacts. Impacts were estimated separately for each the segments of the line that will be located in Kansas, Missouri, Illinois, and Indiana. In addition, impacts were estimated at both the state and national levels. In the former, indirect and induced impacts are limited by spending associated with the construction of the line that occurs in other states. Estimating the impacts at the national level captures the majority of this “out-of-state” spending, resulting in larger indirect and induced impacts than those associated with in-state spending.

3.2.1 Kansas

Table 3.3 summarizes the direct, indirect, induced, and total impacts of increases in final demand for the components –wire, structures – of the new transmission line, installation of the converters, construction of the line, and architectural, financial, energy, and right-of-way requirements associated with the segment of the line constructed in Kansas.

Table 3.3: Estimated State-Level Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Kansas

Component	Change in Final Demand ¹	Impact	Direct	Indirect	Induced	Total	Annual Average ⁴
Installation of Structures	\$336.6	Employment ²	2,657	536	956	4,149	1,383
		Labor Income ³	\$159.8	\$32.7	\$42.6	\$235.1	\$78.4
		Output	\$336.6	\$117.6	\$140.4	\$594.6	\$198.2
Manufacture Structures	\$88.7	Employment	299	144	149	592	197
		Labor Income	\$21.9	\$7.9	\$6.6	\$36.5	\$12.2
		Output	\$88.7	\$23.4	\$21.9	\$134.0	\$44.7
Manufacture Wire	\$49.1	Employment	78	49	51	178	59
		Labor Income	\$6.8	\$3.2	\$2.3	\$12.2	\$4.1
		Output	\$49.1	\$11.0	\$7.5	\$67.5	\$22.5
Architectural Services	\$34.7	Employment	248	71	119	438	146
		Labor Income	\$20.3	\$3.6	\$5.3	\$29.2	\$9.7
		Output	\$34.7	\$9.5	\$17.4	\$61.6	\$20.5
Right of Way	\$35.0	Employment	232	54	28	313	104
		Labor Income	\$3.1	\$2.4	\$1.2	\$6.8	\$2.3
		Output	\$35.0	\$8.6	\$4.1	\$47.7	\$15.9
Financial	\$11.4	Employment	38	54	16	108	36
		Labor Income	\$0.7	\$2.3	\$0.7	\$3.7	\$1.2
		Output	\$11.4	\$9.0	\$2.3	\$22.8	\$7.6
Electric Power	\$6.7	Employment	6	9	7	23	8
		Labor Income	\$1.0	\$0.5	\$0.3	\$1.8	\$0.6
		Output	\$6.7	\$2.1	\$1.1	\$9.9	\$3.3
Installation of Converters/ Transformers	\$99.0	Employment	782	158	281	1,221	407
		Labor Income	\$47.0	\$9.6	\$12.5	\$69.2	\$23.1
		Output	\$99.0	\$34.6	\$41.3	\$174.9	\$58.3
Totals	\$661.2	Employment	4,340	1,075	1,607	7,021	2,340
		Labor Income	\$260.7	\$62.2	\$71.5	\$394.4	\$131.5
		Output	\$661.2	\$215.9	\$235.9	\$1,113.0	\$371.0

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

Referring to Table 3.3, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-related activities directly tied to the transmission line are completed by in-state firms, manufacturing of structures and wire; construction of the transmission line; installation of a converter; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power would generate substantial economic impacts in Kansas. In total, it is estimated that approximately 2,340 jobs would be created in each year of the three-year period during which the line is being constructed. More than 61 percent (886) of the total *direct* jobs (1,447) created in each of the three years would result from the construction of the proposed line. Labor income impacts would also be substantial with \$86.9 million per year in direct impacts. Factoring in indirect and induced income impacts increases the annual average labor income impact to \$131.5.

3.2.2 Missouri

Table 3.4 summarizes the direct, indirect, induced, and total impacts of increases in final demand for the components –wire, structures – of the new transmission line, installation of the converters, construction of the line, and architectural, financial, energy, and right-of-way requirements associated with the segment of the line constructed in Missouri.

Table 3.4: Estimated State-Level Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Missouri

Component	Change in Final Demand ¹	Impact	Direct	Indirect	Induced	Total	Annual Average ⁴
Installation of Structures	\$192.3	<i>Employment</i> ²	1,490	355	657	2,502	834
		<i>Labor Income</i> ³	\$93.0	\$23.2	\$31.5	\$147.7	\$49.2
		<i>Output</i>	\$192.3	\$60.6	\$96.4	\$349.4	\$116.5
Manufacture Structures	\$50.7	<i>Employment</i>	171	102	106	379	126
		<i>Labor Income</i>	\$12.5	\$6.2	\$5.1	\$23.8	\$7.9
		<i>Output</i>	\$50.7	\$16.9	\$15.6	\$83.2	\$27.7
Manufacture Wire	\$28.1	<i>Employment</i>	46	33	33	112	37
		<i>Labor Income</i>	\$3.4	\$2.3	\$1.6	\$7.3	\$2.4
		<i>Output</i>	\$28.1	\$6.9	\$4.9	\$39.9	\$13.3
Architectural Services	\$19.8	<i>Employment</i>	138	47	82	267	89
		<i>Labor Income</i>	\$11.8	\$2.6	\$3.9	\$18.4	\$6.1
		<i>Output</i>	\$19.8	\$6.4	\$12.0	\$38.2	\$12.7
Right of Way	\$20.0	<i>Employment</i>	126	36	20	182	61
		<i>Labor Income</i>	\$1.8	\$1.8	\$1.0	\$4.6	\$1.5
		<i>Output</i>	\$20.0	\$5.6	\$3.0	\$28.6	\$9.5
Financial	\$6.5	<i>Employment</i>	19	28	13	60	20
		<i>Labor Income</i>	\$0.6	\$1.5	\$0.6	\$2.7	\$0.9
		<i>Output</i>	\$6.5	\$5.0	\$1.9	\$13.4	\$4.5
Electric Power	\$3.8	<i>Employment</i>	4	6	5	15	5
		<i>Labor Income</i>	\$0.6	\$0.3	\$0.2	\$1.1	\$0.4
		<i>Output</i>	\$3.8	\$1.0	\$0.7	\$5.6	\$1.9
Installation of Converters/Transformers	\$33.0	<i>Employment</i>	256	61	113	429	143
		<i>Labor Income</i>	\$16.0	\$4.0	\$5.4	\$25.3	\$8.4
		<i>Output</i>	\$33.0	\$10.4	\$16.5	\$59.9	\$20.0
Totals	\$354.2	<i>Employment</i>	2,250	667	1,030	3,946	1,315
		<i>Labor Income</i>	\$139.7	\$41.9	\$49.4	\$231.0	\$77.0
		<i>Output</i>	\$354.2	\$112.8	\$151.1	\$618.1	\$206.0

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.
 2. All employment figures are full time equivalents.
 3. Labor Income = Employee compensation + Proprietor income.
 4. Assumes a three-year construction period.

Referring to Table 3.4, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-related activities and directly tied to the transmission line are completed by in-state firms, manufacturing of structures and wire; construction of the transmission line; installation of a converter; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power would generate substantial economic impacts in Missouri. In total, it is estimated that approximately 1,315 jobs would be created in each year of the three-year period during which the line is being constructed. More than 66 percent (497) of the total direct jobs (750) created in each of the three years would result from the construction of the proposed line. Labor income impacts would also be substantial with \$46.6 million per year in direct impacts. Factoring in indirect and induced income impacts increases the annual average labor income impact to \$77 million.

3.2.3 Illinois

Table 3.5 summarizes the direct, indirect, induced, and total impacts of increases in final demand for the components –wire, structures – of the new transmission line, installation of the converters, construction of the line, and architectural, financial, energy, and right-of-way requirements associated with the segment of the line constructed in Illinois.

Table 3.5: Estimated State-Level Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Illinois

Component	Change in Final Demand ¹	Impact	Direct	Indirect	Induced	Total	Annual Average ⁴
Installation of Structures	\$192.3	Employment ²	1,355	299	619	2,273	758
		Labor Income ³	\$101.0	\$22.6	\$34.0	\$157.7	\$52.6
		Output	\$192.3	\$65.4	\$101.2	\$358.9	\$119.6
Manufacture Structures	\$50.7	Employment	161	88	103	352	117
		Labor Income	\$14.2	\$6.3	\$5.7	\$26.1	\$8.7
		Output	\$50.7	\$16.7	\$16.9	\$84.3	\$28.1
Manufacture Wire	\$28.1	Employment	41	28	39	107	36
		Labor Income	\$5.3	\$2.3	\$2.2	\$9.8	\$3.3
		Output	\$28.1	\$6.8	\$6.4	\$41.3	\$13.8
Architectural Services	\$19.8	Employment	135	42	74	252	84
		Labor Income	\$12.0	\$2.9	\$4.1	\$18.9	\$6.3
		Output	\$19.8	\$6.6	\$12.2	\$38.6	\$12.9
Right of Way	\$20.0	Employment	93	22	17	132	44
		Labor Income	\$2.0	\$1.3	\$0.9	\$4.3	\$1.4
		Output	\$20.0	\$4.0	\$2.8	\$26.8	\$8.9
Financial	\$6.5	Employment	18	22	13	52	17
		Labor Income	\$0.8	\$1.7	\$0.7	\$3.1	\$1.0
		Output	\$6.5	\$4.4	\$2.1	\$13.0	\$4.3
Electric Power	\$3.8	Employment	3	4	5	12	4
		Labor Income	\$0.6	\$0.3	\$0.3	\$1.2	\$0.4
		Output	\$3.8	\$1.0	\$0.8	\$5.6	\$1.9
Installation of Converters/Transformers	\$99.0	Employment	697	154	319	1,170	390
		Labor Income	\$52.0	\$11.7	\$17.5	\$81.2	\$27.1
		Output	\$99.0	\$33.7	\$52.1	\$184.8	\$61.6
Totals	\$420.2	Employment	2,502	659	1,189	4,350	1,450
		Labor Income	\$188.0	\$49.1	\$65.3	\$302.3	\$100.8
		Output	\$420.2	\$138.7	\$194.3	\$753.3	\$251.1

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

Referring to Table 3.5, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-related activities and directly tied to the transmission line are completed by in-state firms, manufacturing of structures and wire; construction of the transmission line; installation of a converter; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power would generate substantial economic impacts in Illinois. In total, it is estimated that approximately 1,450 jobs would be created in each year of the three-year period during which the line is being constructed. More than 54 percent (452) of the total direct jobs (834) created in each of the three years would result from the construction of the proposed line. Labor income impacts would also be substantial with \$62.7 million per year in direct impacts. Factoring in indirect and induced income impacts increases the annual average labor income impact to \$100.8 million.

3.2.4 Indiana

Table 3.6 summarizes the direct, indirect, induced, and total impacts of increases in final demand for the components –wire, structures – of the new transmission line, installation of the converters, construction of the line, and architectural, financial, energy, and right-of-way requirements associated with the segment of the line constructed in Indiana.

Table 3.6: Estimated State-Level Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Indiana

Component	Change in Final Demand ¹	Impact	Direct	Indirect	Induced	Total	Annual Average ⁴
Installation of Structures	\$1.9	Employment ²	15	3	6	23	8
		Labor Income ³	\$0.95	\$0.16	\$0.26	\$1.37	\$0.46
		Output	\$1.92	\$0.60	\$0.87	\$3.39	\$1.13
Manufacture Structures	\$0.5	Employment	2	1	1	3	1
		Labor Income	\$0.13	\$0.05	\$0.04	\$0.22	\$0.07
		Output	\$0.51	\$0.15	\$0.14	\$0.80	\$0.27
Manufacture Wire	\$0.3	Employment	0	0	0	1	0
		Labor Income	\$0.04	\$0.02	\$0.01	\$0.07	\$0.02
		Output	\$0.28	\$0.06	\$0.05	\$0.39	\$0.13
Architectural Services	\$0.2	Employment	2	0	1	3	1
		Labor Income	\$0.11	\$0.02	\$0.03	\$0.16	\$0.05
		Output	\$0.20	\$0.06	\$0.10	\$0.36	\$0.12
Right of Way	\$0.2	Employment	1	0	0	2	1
		Labor Income	\$0.02	\$0.01	\$0.01	\$0.04	\$0.01
		Output	\$0.20	\$0.05	\$0.02	\$0.27	\$0.09
Financial	\$0.1	Employment	0	0	0	0	0
		Labor Income	\$0.01	\$0.01	\$0.00	\$0.02	\$0.01
		Output	\$0.07	\$0.04	\$0.01	\$0.11	\$0.04
Electric Power	\$0.04	Employment	0	0	0	0	0
		Labor Income	\$0.01	\$0.00	\$0.00	\$0.01	\$0.00
		Output	\$0.04	\$0.01	\$0.01	\$0.05	\$0.02
Installation of Converters/Transformers	\$6.6	Employment	50	9	20	80	27
		Labor Income	\$3.26	\$0.55	\$0.90	\$4.70	\$1.57
		Output	\$6.60	\$2.07	\$2.97	\$11.64	\$3.88
Totals	\$9.8	Employment	70	14	28	113	38
		Labor Income	\$4.51	\$0.82	\$1.26	\$6.59	\$2.20
		Output	\$9.81	\$3.04	\$4.16	\$17.02	\$5.67

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

Referring to Table 3.6, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-related activities and directly tied to the transmission line are completed by in-state firms, manufacturing of structures and wire; construction of the transmission line; installation of a transformer; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power would generate measurable economic impacts in Indiana. In total, it is estimated that approximately 38 jobs would be created in each year of the three-year period during which the line is being constructed. Approximately 74 percent (17) of the total direct jobs (23) created in each of the three years would result from the installation of the transformer. Labor income impacts would amount to \$1.5 million per year in direct impacts. Factoring in indirect and induced income impacts increases the annual average to \$2.2 million.

3.2.5 Assessment of Estimated State-Level Impacts

We have already stated that the impacts reported in Tables 3.3 – 3.6 reflect the assumption that 50 percent of manufacturing-related activities and 100 percent of construction-related activities would be completed by in-state firms; however, this assumption warrants further consideration. In particular, we need to examine whether it is *reasonable* to expect that industries in each state would be able to handle the projected increase in demand.

The reasonableness of the approach employed here can be addressed, to a first approximation, by examining the potential for existing industries in each state to accommodate the projected increases in demand considered here. Table 3.7 summarizes employment levels in each of the affected industries in Kansas, Missouri, Illinois, and Indiana in 2011, as well as the projected annual increases in employment in each of the seven directly impacted sectors (*Construction of other new nonresidential structures; Plate work and fabricated structural product manufacturing; Communication and energy wire and cable manufacturing; Architectural, engineering, and related services; Real estate; Funds, trusts, and other financial vehicles; and Electric power generation, transmission, and distribution*) in both absolute and percentage terms.

Table 3.7: Comparison of Baseline Employment to Projected Annual Impacts in Kansas, Missouri, Illinois, and Indiana

Component	Employment ¹	Kansas	Missouri	Illinois	Indiana
Installation of Structures	<i>Current</i>	26,081	53,411	78,598	53,875
	<i>Projected Increase</i>	1383	834	758	8
	<i>% Change</i>	5.3%	1.6%	1.0%	0.0%
Manufacture Structures	<i>Current</i>	2,256	2,716	6,987	4,734
	<i>Projected Increase</i>	197	126	117	1
	<i>% Change</i>	8.7%	4.7%	1.7%	0.0%
Manufacture Wire	<i>Current</i>	575	239	684	304
	<i>Projected Increase</i>	59	37	36	0
	<i>% Change</i>	10.3%	15.7%	5.2%	0.0%
Architectural Services	<i>Current</i>	18,462	29,017	61,275	27,611
	<i>Projected Increase</i>	146	89	84	1
	<i>% Change</i>	0.8%	0.3%	0.1%	0.0%
Right of Way	<i>Current</i>	50,647	121,734	240,916	109,293
	<i>Projected Increase</i>	104	61	44	1
	<i>% change</i>	0.2%	0.0%	0.0%	0.0%
Financial	<i>Current</i>	3,105	8,587	22,989	3,105
	<i>Projected Increase</i>	36	20	17	0
	<i>% Change</i>	1.2%	0.2%	0.1%	0.0%
Electric Power	<i>Current</i>	6,040	8,636	18,595	11,203
	<i>Projected Increase</i>	8	5	4	0
	<i>% Change</i>	0.1%	0.1%	0.0%	0.0%
Installation of Converters/Transformers	<i>Current</i>	26,081	53,411	78,598	53,875
	<i>Projected Increase</i>	407	143	390	27
	<i>% Change</i>	1.6%	0.3%	0.5%	0.1%
Totals	<i>Employment</i>				
	<i>Labor Income</i>				
	<i>Output</i>	\$9,999.9	\$9,999.9	\$9,999.9	\$9,999.9

1. All employment figures are full time equivalents.

2. Assumes a three-year construction period.

Referring to Table 3.7, in Illinois and Indiana, all seven of the affected sectors should be able to absorb the increased demand associated with manufacturing of the required components and construction of the proposed transmission line. The only possible exception is manufacturing of the required wire in Illinois. The *Communications and energy wire and cable manufacturing* sector would experience an estimated 5.2 percent increase in employment in Illinois. Considering, however, the current state of the economy in

Illinois (the unemployment is currently 9 percent), and the fact that the predicted increase in jobs is 36 FTE positions, there is likely sufficient excess capacity within the industry in Illinois to absorb the projected increase.

Turning to Missouri, six of the seven affected sectors should be able to absorb the increased demand associated with manufacturing of the required components and construction of the proposed transmission line. Referring to Table 3.7, the only possible exception is manufacturing of the needed wire. The *Communications and energy wire and cable manufacturing* sector would experience an estimated 15.7 percent increase in employment in Missouri. As was the case in Illinois, however, the current state of the economy in Missouri (the unemployment is currently 6.5 percent), and the fact that the predicted increase in jobs is 37 FTE positions, there is likely sufficient excess capacity within the industry in Missouri to absorb the projected increase.

Finally, considering Kansas, it is reasonable to expect that five of the seven sectors should be able to absorb the increased demand associated with manufacturing of the required components and construction of the proposed transmission line. The only possible exceptions include manufacturing of the wire and structures required for that portion of the line that will be constructed in Kansas. As shown in Table 3.7, the *Communications and energy wire and cable manufacturing* sector would experience an estimated 10.3 percent increase in employment, while the *Plate work and fabricated structural product manufacturing* sector would experience an estimated 8.7 percent increase in employment in Kansas. With an unemployment rate currently at 5.5 percent, some might argue that Kansas is nearing full employment overall. That being said, the predicted increase in FTE positions in each sector – 197 in *Plate work* and 59 in *Communications and energy wire* – do not appear to be excessively large.⁷

⁷ If we were to take the position that neither sector would be able to absorb more than a 6% increase in employment, the effect would be to reduce the total number of additional jobs associated with the manufacturing of the required components and construction of the proposed transmission line in Kansas by 87 FTE jobs, or less than 4%, in each year of the assumed three-year construction period.

3.3 Manufacturing and Construction Impacts at the National Level

The state-level impacts reported in Tables 3.3 – 3.6 summarize the estimated impacts of the increased spending that is assumed to occur *within* each state’s respective boundaries. It is important to recognize, however, that some of the spending associated with the manufacture and construction of the proposed transmission line in each state will actually occur outside of the state. For example, it is assumed that 50 percent of the direct spending on the manufacturing of the wire that will be used in the portion of the transmission line located in a particular state will be paid to one or more wire manufacturers located in that state. In fact, however, it is reasonable to expect that some of the materials the in-state manufacturers use to produce the wire in question may come from vendors located *outside* of the particular state. The spending on materials produced out-of-state is viewed as a “leakage” from the particular state insofar as it will yield no subsequent indirect or induced spending within that state. This “leakage” will, however, lead to indirect and induced spending elsewhere. To the extent that this spending occurs elsewhere in the United States, one or more of the remaining states will benefit from the construction, operation, and maintenance of the proposed transmission line as well. In addition, recall that 50 percent of the manufacturing of structures and wire associated with that portion of the transmission line that would be built in each state, as well as the transformer that would be installed in Indiana, are assumed to occur elsewhere in the United States.

To capture the indirect and induced impacts of the sources of additional spending described in the preceding paragraph (i.e., “leakages,” the 50 percent of direct spending on the manufacture of structures and wire explicitly assumed to occur outside of each state, and the manufacture of the transformer to be installed in Indiana), additional analysis was conducted. To be specific, the impacts of the state-specific expenditures summarized in Tables 3.3 – 3.6 were re-estimated for the region consisting of the entire United States. To hold constant the characteristics of each industry that is assumed to experience the initial increase in final demand in each state (e.g., 50 percent in-state manufacture of structures and wire in Kansas), the national model was recalibrated to reflect the industry-specific characteristics in each sector (IMPLAN sectors 36, 186, 244, 272, 359, 360, 369) and state in which final demand would initially increase. If the specific U.S. industry relationships (output per worker, ratio of employee compensation to output, etc.) were not revised to reflect the relevant state-specific (i.e., Kansas, Missouri, Illinois, Indiana) relationships, the differences reported in Tables 3.8 – 3.11 would be due not only to internalizing trade flows at the national level, but to differences in the industry at the state versus national level as well.

The results of the estimation of national-level impacts of spending on the manufacture and construction of the proposed transmission line are reported in Tables 3.8 – 3.11. It is important to note that the *direct impacts* reported in Tables 3.8 – 3.11 match those reported in Tables 3.3 – 3.6, respectively. This is due to the recalibration described above. Inspection of the indirect and induced impacts shows that these effects are larger at the national level than they are at the state level. Once again, this reflects the capture of indirect and induced spending that would occur outside of the four-state region.

3.3.1 Kansas – US

The national-level impacts of increases in final demand for the components – wire, structures – of the new transmission line, installation of the converters, construction of the line, and right-of-way requirements associated with the segment of the line constructed in Kansas are summarized in Table 3.8.

Table 3.8: Estimated National-Level Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Kansas

Component	Change in Final Demand ¹	Impact	Direct	Indirect	Induced	Total	Annual Average ⁴
Installation of Structures	\$336.6	<i>Employment</i> ²	2,657	1,125	1,907	5,689	1,896
		<i>Labor Income</i> ³	\$159.8	\$81.5	\$106.3	\$347.6	\$115.9
		<i>Output</i>	\$336.6	\$273.4	\$339.6	\$949.5	\$316.5
Manufacture Structures	\$88.7	<i>Employment</i>	299	384	391	1,074	358
		<i>Labor Income</i>	\$21.9	\$26.9	\$21.8	\$70.7	\$23.6
		<i>Output</i>	\$88.7	\$100.6	\$69.6	\$258.9	\$86.3
Manufacture Wire	\$49.1	<i>Employment</i>	78	162	158	399	133
		<i>Labor Income</i>	\$6.8	\$12.6	\$8.8	\$28.2	\$9.4
		<i>Output</i>	\$49.1	\$70.9	\$28.2	\$148.2	\$49.4
Architectural Services	\$34.7	<i>Employment</i>	248	119	220	587	196
		<i>Labor Income</i>	\$20.3	\$7.5	\$12.3	\$40.1	\$13.4
		<i>Output</i>	\$34.7	\$19.5	\$39.2	\$93.3	\$31.1
Right of Way	\$35.0	<i>Employment</i>	232	86	63	381	127
		<i>Labor Income</i>	\$3.2	\$4.7	\$3.5	\$11.4	\$3.8
		<i>Output</i>	\$35.0	\$15.0	\$11.0	\$61.0	\$20.3
Financial	\$11.4	<i>Employment</i>	38	82	55	175	58
		<i>Labor Income</i>	\$0.7	\$6.0	\$3.1	\$9.8	\$3.3
		<i>Output</i>	\$11.4	\$16.6	\$9.8	\$37.9	\$12.6
Electric Power	\$6.7	<i>Employment</i>	6	14	16	36	12
		<i>Labor Income</i>	\$1.0	\$1.0	\$0.9	\$2.9	\$1.0
		<i>Output</i>	\$6.7	\$3.5	\$2.9	\$13.1	\$4.4
Installation of Converters/Transformers	\$99.0	<i>Employment</i>	782	331	561	1,673	558
		<i>Labor Income</i>	\$47.0	\$24.0	\$31.3	\$102.2	\$34.1
		<i>Output</i>	\$99.0	\$80.4	\$99.9	\$279.3	\$93.1
Totals	\$661.2	<i>Employment</i>	4,340	2,304	3,371	10,015	3,338
		<i>Labor Income</i>	\$260.7	\$164.2	\$187.9	\$612.8	\$204.3
		<i>Output</i>	\$661.2	\$579.8	\$600.1	\$1,841.2	\$613.7

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

According to Table 3.8, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-related activities directly tied to the transmission line are completed by in-state firms, the indirect and induced impacts of spending on manufacturing of structures and wire; construction of the transmission line; installation of a converter; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power associated with that segment of the proposed transmission line located in Kansas increase substantially when the scope of the analysis is expanded to the national level. Total employment impacts increase by approximately 998⁸ jobs per year, to approximately 3,338 full-time equivalent jobs per year over the three-year construction period. Total labor income increases by \$72.8 million per year, to \$204.3 million per year for three years.

⁸ The difference in FTE jobs and labor income is calculated by comparing the relevant values in Tables 3.8 and 3.3. The same approach is employed in discussing the results in Tables 3.9-3.11.

3.3.2 Missouri – US

The national-level impacts of increases in final demand for the components –wire, structures – of the new transmission line, installation of the converters, construction of the line, and right-of-way requirements associated with the segment of the line constructed in Missouri are summarized in Table 3.9.

Table 3.9: Estimated National-Level Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Missouri

Component	Change in Final Demand ¹	Impact	Direct	Indirect	Induced	Total	Annual Average ⁴
Installation of Structures	\$192.3	<i>Employment</i> ²	1,490	631	1,095	3,216	1,072
		<i>Labor Income</i> ³	\$93.0	\$45.7	\$61.0	\$199.7	\$66.6
		<i>Output</i>	\$192.3	\$153.3	\$194.9	\$540.6	\$180.2
Manufacture Structures	\$50.7	<i>Employment</i>	171	219	223	614	205
		<i>Labor Income</i>	\$12.5	\$15.4	\$12.5	\$40.4	\$13.5
		<i>Output</i>	\$50.7	\$57.4	\$39.8	\$147.9	\$49.3
Manufacture Wire	\$28.1	<i>Employment</i>	46	96	88	230	77
		<i>Labor Income</i>	\$3.4	\$7.4	\$4.9	\$15.7	\$5.2
		<i>Output</i>	\$28.1	\$41.8	\$15.7	\$85.5	\$28.5
Architectural Services	\$19.8	<i>Employment</i>	138	66	126	331	110
		<i>Labor Income</i>	\$11.8	\$4.2	\$7.0	\$23.0	\$7.7
		<i>Output</i>	\$19.8	\$10.9	\$22.5	\$53.2	\$17.7
Right of Way	\$20.0	<i>Employment</i>	126	47	35	208	69
		<i>Labor Income</i>	\$1.8	\$2.6	\$2.0	\$6.4	\$2.1
		<i>Output</i>	\$20.0	\$8.3	\$6.2	\$34.5	\$11.5
Financial	\$6.5	<i>Employment</i>	19	42	30	91	30
		<i>Labor Income</i>	\$0.6	\$3.1	\$1.7	\$5.4	\$1.8
		<i>Output</i>	\$6.5	\$8.4	\$5.4	\$20.4	\$6.8
Electric Power	\$3.8	<i>Employment</i>	4	8	9	21	7
		<i>Labor Income</i>	\$0.6	\$0.6	\$0.5	\$1.7	\$0.6
		<i>Output</i>	\$3.8	\$2.1	\$1.6	\$7.5	\$2.5
Installation of Converters/ Transformers	\$33.0	<i>Employment</i>	256	108	188	552	184
		<i>Labor Income</i>	\$16.0	\$7.8	\$10.5	\$34.3	\$11.4
		<i>Output</i>	\$33.0	\$26.3	\$33.4	\$92.8	\$30.9
Totals	\$354.2	<i>Employment</i>	2,250	1,218	1,795	5,263	1,754
		<i>Labor Income</i>	\$139.7	\$86.8	\$100.1	\$326.5	\$108.8
		<i>Output</i>	\$354.2	\$308.5	\$319.7	\$982.4	\$327.5

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

According to Table 3.9, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-related activities directly tied to the transmission line are completed by in-state firms, the indirect and induced impacts of spending on manufacturing of structures and wire; construction of the transmission line; installation of a converter; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power associated with that segment of the proposed transmission line located in Missouri increase substantially when the scope of the analysis is expanded to the national level. Total employment impacts increase by approximately 439 jobs per year, to approximately 1,754 full-time equivalent jobs per year over the three-year construction period. Total labor income increases by \$31.8 million per year, to \$108.8 million per year for three years.

3.3.3 Illinois – US

The national-level impacts of increases in final demand for the components –wire, structures – of the new transmission line, installation of the converters, construction of the line, and right-of-way requirements associated with the segment of the line constructed in Illinois are summarized in Table 3.10.

Table 3.10: Estimated National-Level Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Illinois

Component	Change in Final Demand ¹	Impact	Direct	Indirect	Induced	Total	Annual Average ⁴
Installation of Structures	\$192.3	<i>Employment</i> ²	1,355	574	1,122	3,051	1,017
		<i>Labor Income</i> ³	\$101.0	\$41.5	\$62.6	\$205.1	\$68.4
		<i>Output</i>	\$192.3	\$139.4	\$199.9	\$531.6	\$177.2
Manufacture Structures	\$50.7	<i>Employment</i>	161	206	230	596	199
		<i>Labor Income</i>	\$14.2	\$14.5	\$12.8	\$41.5	\$13.8
		<i>Output</i>	\$50.7	\$54.1	\$40.9	\$145.6	\$48.5
Manufacture Wire	\$28.1	<i>Employment</i>	41	84	97	222	74
		<i>Labor Income</i>	\$5.3	\$6.6	\$5.4	\$17.4	\$5.8
		<i>Output</i>	\$28.1	\$37.0	\$17.3	\$82.3	\$27.4
Architectural Services	\$19.8	<i>Employment</i>	135	65	127	326	109
		<i>Labor Income</i>	\$12.0	\$4.1	\$7.1	\$23.2	\$7.7
		<i>Output</i>	\$19.8	\$10.6	\$22.6	\$53.0	\$17.7
Right of Way	\$20.0	<i>Employment</i>	93	34	31	158	53
		<i>Labor Income</i>	\$2.0	\$1.9	\$1.7	\$5.7	\$1.9
		<i>Output</i>	\$20.0	\$6.3	\$5.6	\$31.8	\$10.6
Financial	\$6.5	<i>Employment</i>	18	38	29	85	28
		<i>Labor Income</i>	\$0.8	\$2.8	\$1.6	\$5.2	\$1.7
		<i>Output</i>	\$6.5	\$7.7	\$5.2	\$19.5	\$6.5
Electric Power	\$3.8	<i>Employment</i>	3	7	9	19	6
		<i>Labor Income</i>	\$0.6	\$0.5	\$0.5	\$1.6	\$0.5
		<i>Output</i>	\$3.8	\$1.8	\$1.6	\$7.2	\$2.4
Installation of Converters/ Transformers	\$99.0	<i>Employment</i>	697	295	578	1,570	523
		<i>Labor Income</i>	\$52.0	\$21.4	\$32.2	\$105.6	\$35.2
		<i>Output</i>	\$99.0	\$71.8	\$102.9	\$273.6	\$91.2
Totals	\$420.2	<i>Employment</i>	2,502	1,303	2,223	6,028	2,009
		<i>Labor Income</i>	\$188.0	\$93.4	\$123.9	\$405.3	\$135.1
		<i>Output</i>	\$420.2	\$328.6	\$396.0	\$1,144.8	\$381.6

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

According to Table 3.10, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-related activities directly tied to the transmission line are completed by in-state firms, the indirect and induced impacts of spending on manufacturing of structures and wire; construction of the transmission line; installation of a converter; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power associated with that segment of the proposed transmission line located in Illinois increase substantially when the scope of the analysis is expanded to the national level. Total employment impacts increase by approximately 559 jobs per year, to approximately 2,009 full-time equivalent jobs per year over the three-year construction period. Total labor income increases by \$34.3 million per year, to \$135.1 million per year for three years.

3.3.4 Indiana – US

The national-level impacts of increases in final demand for the components –wire, structures – of the new transmission line, installation of the converters, construction of the line, and right-of-way requirements associated with the segment of the line constructed in Indiana are summarized in Table 3.11.

Table 3.11: Estimated National-Level Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Indiana

Component	Change in Final Demand ¹	Impact	Direct	Indirect	Induced	Total	Annual Average ⁴
Installation of Structures	\$1.9	Employment ²	15	6	11	32	11
		Labor Income ³	\$0.95	\$0.45	\$0.61	\$2.01	\$0.67
		Output	\$1.92	\$1.50	\$1.96	\$5.39	\$1.80
Manufacture Structures	\$0.5	Employment	2	2	2	6	2
		Labor Income	\$0.13	\$0.15	\$0.13	\$0.41	\$0.14
		Output	\$0.51	\$0.56	\$0.40	\$1.47	\$0.49
Manufacture Wire	\$0.3	Employment	0	1	1	2	1
		Labor Income	\$0.04	\$0.07	\$0.05	\$0.16	\$0.1
		Output	\$0.28	\$0.40	\$0.16	\$0.85	\$0.3
Architectural Services	\$0.2	Employment	2	1	1	4	1
		Labor Income	\$0.11	\$0.05	\$0.07	\$0.23	\$0.08
		Output	\$0.20	\$0.12	\$0.22	\$0.54	\$0.18
Right of Way	\$0.2	Employment	1	1	0	2	1
		Labor Income	\$0.02	\$0.03	\$0.02	\$0.07	\$0.02
		Output	\$0.20	\$0.09	\$0.06	\$0.35	\$0.12
Financial	\$0.1	Employment	0	0	0	1	0
		Labor Income	\$0.01	\$0.03	\$0.02	\$0.05	\$0.02
		Output	\$0.07	\$0.08	\$0.05	\$0.20	\$0.07
Electric Power	\$0.04	Employment	0	0	0	0	0
		Labor Income	\$0.01	\$0.01	\$0.01	\$0.02	\$0.01
		Output	\$0.04	\$0.02	\$0.02	\$0.08	\$0.03
Installation of Converters/ Transformers	\$6.6	Employment	50	21	38	109	36
		Labor Income	\$3.26	\$1.54	\$2.11	\$6.90	\$2.30
		Output	\$6.60	\$5.15	\$6.74	\$18.49	\$6.16
Totals	\$9.8	Employment	70	32	54	156	52
		Labor Income	\$4.51	\$2.32	\$3.01	\$9.84	\$3.28
		Output	\$9.81	\$7.93	\$9.61	\$27.36	\$9.12

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

According to Table 3.11, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-related activities directly tied to the transmission line are completed by in-state firms, the indirect and induced impacts of spending on manufacturing of structures and wire; construction of the transmission line; installation of a transformer; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power associated with that segment of the proposed transmission line located in Indiana increase substantially when the scope of the analysis is expanded to the national level. Total employment impacts increase by approximately 14 jobs per year, to approximately 52 full-time equivalent jobs per year over the three-year construction period. Total labor income increases by \$1.08 million per year, to \$3.28 million per year for three years.

3.3.5 Manufacturing Outside of the Four-State Region

It was also necessary to estimate the impacts of the 50 percent of manufacturing of structures and wire required for the transmission line that was assumed to occur outside of the four-state region, as well as the transformer that will be installed in Indiana. Those results are reported in Table 3.12.

Table 3.12: Estimated National-Level Impacts of Manufacturing 50 percent of Structures and Wire, and Transformers Outside of Four-State Region

Component	Change in Final Demand ¹		Direct	Indirect	Induced	Total	Annual Average ⁴
	Impact						
Manufacture Structures	\$190.6	<i>Employment</i> ²	630	808	848	2,286	762
		<i>Labor Income</i> ³	\$49.3	\$56.8	\$47.3	\$153.3	\$51.1
		<i>Output</i>	\$190.6	\$211.6	\$151.0	\$553.2	\$184.4
Manufacture Wire	\$105.5	<i>Employment</i>	161	335	351	847	282
		<i>Labor Income</i>	\$16.9	\$26.1	\$19.5	\$62.6	\$20.9
		<i>Output</i>	\$105.5	\$146.6	\$62.5	\$314.5	\$104.8
Manufacture of Transformers	\$13.4	<i>Employment</i>	57	49	62	168	56
		<i>Labor Income</i>	\$3.8	\$3.9	\$3.5	\$11.2	\$3.7
		<i>Output</i>	\$13.4	\$13.3	\$11.1	\$37.8	\$12.6
Totals	\$309.5	<i>Employment</i>	848	1,192	1,261	3,301	1,100
		<i>Labor Income</i>	\$70.0	\$86.8	\$70.3	\$227.1	\$75.7
		<i>Output</i>	\$309.5	\$371.5	\$224.6	\$905.6	\$301.9

1. All spending and \$ impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

Referring to Table 3.12, the 50 percent of manufacturing of structures and wire required for the transmission line that is assumed to occur outside of the four-state region, as well as the transformer that would be installed in Indiana would generate substantial economic impacts at the national level. In total, approximately 1,100 jobs would be created in each year of the three-year period during which the line is being constructed. Labor income impacts would also be substantial with \$23.3 million per year in direct impacts. Factoring in indirect and induced income impacts increases the annual average to \$75.7 million.

3.4 Operations and Maintenance Impacts at the State Level

Clean Line estimates that annual operation and maintenance (O&M) costs, which would be incurred when the line is up and running, would amount to approximately one percent of total construction costs. In Kansas, this amounts to \$10.0 million of additional spending each year. The corresponding amounts for Missouri, Illinois, and Indiana are \$5.0 million, \$7.0 million, and \$0.2 million, respectively. The estimated impacts of annual O&M expenditures in each state are summarized in Tables 3.13 – 3.16.

3.4.1 Kansas

As shown in Table 3.13, the direct effects of annual O&M expenditures in Kansas include 88 jobs and \$5.3 million in labor income. These impacts increase to 135 jobs and \$7.6 million of labor income when indirect and induced impacts are factored in.

Table 3.13: Estimated Impacts of Annual O&M-Related Expenditures on Grain Belt Express Clean Line in Kansas (Total annual spending = \$10.0 million)

Impact ¹	Direct	Indirect	Induced	Total
Employment ²	88	16	31	135
Labor Income ³	\$5.3	\$0.9	\$1.4	\$7.6
Output	\$10.0	\$3.2	\$4.5	\$17.7

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.
3. Labor Income = Employee compensation + Proprietor income.

3.4.2 Missouri

As shown in Table 3.14, the direct effects of annual O&M expenditures in Missouri include 43 jobs and \$2.7 million in labor income. These impacts increase to 70 jobs and \$4.1 million of labor income when indirect and induced impacts are factored in.

Table 3.14: Estimated Impacts of Annual O&M-Related Expenditures on Grain Belt Express Clean Line in Missouri (Total annual spending = \$5.0 million)

Impact ¹	Direct	Indirect	Induced	Total
Employment ²	43	9	18	70
Labor Income ³	\$2.7	\$0.5	\$0.9	\$4.1
Output	\$5.0	\$1.5	\$2.7	\$9.2

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.
3. Labor Income = Employee compensation + Proprietor income.

3.4.3 Illinois

As shown in Table 3.15, the direct effects of annual O&M expenditures in Illinois include 54 jobs and \$4.1 million in labor income. These impacts increase to 88 jobs and \$6.1 million of labor income when indirect and induced impacts are factored in.

Table 3.15: Estimated Impacts of Annual O&M-Related Expenditures on Grain Belt Express Clean Line in Illinois (Total annual spending = \$7.0 million)

Impact ¹	Direct	Indirect	Induced	Total
Employment ²	54	10	24	88
Labor Income ³	\$4.1	\$0.7	\$1.3	\$6.1
Output	\$7.0	\$2.1	\$3.9	\$13.1

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.
3. Labor Income = Employee compensation + Proprietor income.

3.4.4 Indiana

As shown in Table 3.16, the direct effects of annual O&M expenditures in Indiana include 2 jobs and \$130 thousand in labor income. These impacts increase to 3 jobs and \$190 thousand of labor income when indirect and induced impacts are factored in.

Table 3.16: Estimated Impacts of Annual O&M-Related Expenditures on Grain Belt Express Clean Line in Indiana (Total annual spending = \$0.2 million)

Impact ¹	Direct	Indirect	Induced	Total
Employment ²	2	0	1	3
Labor Income ³	\$0.13	\$0.02	\$0.04	\$0.19
Output	\$0.24	\$0.07	\$0.12	\$0.43

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.
3. Labor Income = Employee compensation + Proprietor income.

3.5 Operations and Maintenance Impacts at the National Level

As was the case with state-level manufacturing and construction-related impacts, to capture the indirect and induced effects of leakages from state-level spending at the national level, the impacts of the state-specific O&M-related expenditures summarized in Tables 3.13 – 3.16 were re-estimated for the region consisting of the entire United States. The results are reported in Tables 3.17 – 3.20.

3.5.1 Kansas – US

As shown in Table 3.17, the indirect and induced impacts of O&M-related expenditures associated with that segment of the proposed transmission line located in Kansas increase when the scope of the analysis is expanded to the national level. Total employment impacts increase by 42, to 177 full-time equivalent jobs. Total labor income increases by \$3.1 million, to \$10.7 million.

Table 3.17: Estimated National-Level Impacts of Annual O&M-Related Expenditures on Grain Belt Express Clean Line in Kansas (Total annual spending = \$10.0 million)

Impact ¹	Direct	Indirect	Induced	Total
Employment ²	88	30	58	177
Labor Income ³	\$5.3	\$2.1	\$3.3	\$10.7
Output	\$10.0	\$7.2	\$10.4	\$27.6

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.
3. Labor Income = Employee compensation + Proprietor income.

3.5.2 Missouri – US

As shown in Table 3.18, the indirect and induced impacts of O&M-related expenditures associated with that segment of the proposed transmission line located in Missouri increase when the scope of the analysis is expanded to the national level. Total employment impacts increase by 18, to 88 full-time equivalent jobs. Total labor income increases by \$1.2 million, to \$5.3 million.

Table 3.18: Estimated National-Level Impacts of Annual O&M-Related Expenditures on Grain Belt Express Clean Line in Missouri (Total annual spending = \$5.0 million)

Impact ¹	Direct	Indirect	Induced	Total
Employment ²	43	15	29	88
Labor Income ³	\$2.7	\$1.0	\$1.6	\$5.3
Output	\$5.0	\$3.5	\$5.2	\$13.8

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.
3. Labor Income = Employee compensation + Proprietor income.

3.5.3 Illinois – US

As shown in Table 3.19, the indirect and induced impacts of O&M-related expenditures associated with that segment of the proposed transmission line located in Illinois increase when the scope of the analysis is expanded to the national level. Total employment impacts increase by 27, to 115 full-time equivalent jobs. Total labor income increases by \$1.6 million, to \$7.7 million.

Table 3.19: Estimated National-Level Impacts of Annual O&M-Related Expenditures on Grain Belt Express Clean Line in Illinois (Total annual spending = \$7.0 million)

Impact ¹	Direct	Indirect	Induced	Total
Employment ²	54	19	42	115
Labor Income ³	4.1	1.3	2.4	7.7
Output	\$7.0	\$4.4	\$7.5	\$19.0

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.
3. Labor Income = Employee compensation + Proprietor income.

3.5.4 Indiana – US

As shown in Table 3.20, the indirect and induced impacts of O&M-related expenditures associated with that segment of the proposed transmission line located in Indiana increase when the scope of the analysis is expanded to the national level. Total employment impacts increase by 1, to 4 full-time equivalent jobs. Total labor income increases by \$70 thousand, to \$260 thousand.

Table 3.20: Estimated National-Level Impacts of Annual O&M-Related Expenditures on Grain Belt Express Clean Line in Indiana (Total annual spending = \$0.2 million)

Impact ¹	Direct	Indirect	Induced	Total
Employment ²	2	1	1	4
Labor Income ³	\$0.13	\$0.05	\$0.08	\$0.26
Output	\$0.24	\$0.17	\$0.25	\$0.66

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.
3. Labor Income = Employee compensation + Proprietor income.

3.6 Summary of Estimated Manufacturing and Construction and O&M-Related Impacts

This section provides an aggregate view of the various impacts reported in Tables 3.3 – 3.6 and Tables 3.8 – 3.20.

3.6.1 Manufacturing and Construction

Table 3.21 summarizes the average annual impacts of manufacture of the inputs to, and construction of, the proposed transmission line at the state and national levels that would occur in each year of the three year construction period.

Table 3.21: Estimated Average Annual Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Kansas, Missouri, Illinois, Indiana, the Four-State Region, and the United States

Component	Impacts ¹	Kansas	Missouri	Illinois	Indiana	Four-State Region	United States
		Annual Avg. ⁴	Annual Avg.	Annual Avg.	Annual Avg.	Annual Avg.	Annual Avg.
Installation of Structures	<i>Employment</i> ²	1,383	834	758	8	2,982	3,996
	<i>Labor Income</i> ³	\$78.4	\$49.2	\$52.6	\$0.46	\$180.6	\$251.5
	<i>Output</i>	\$198.2	\$116.5	\$119.6	\$1.13	\$435.4	\$675.7
Manufacture Structures	<i>Employment</i>	197	126	117	1	442	1525
	<i>Labor Income</i>	\$12.2	\$7.9	\$8.7	\$0.07	\$28.9	\$102.1
	<i>Output</i>	\$44.7	\$27.7	\$28.1	\$0.27	\$100.7	\$369.0
Manufacture Wire	<i>Employment</i>	59	37	36	0	133	566
	<i>Labor Income</i>	\$4.1	\$2.4	\$3.3	\$0.02	\$9.8	\$41.3
	<i>Output</i>	\$22.5	\$13.3	\$13.8	\$0.13	\$49.7	\$210.5
Architectural Services	<i>Employment</i>	146	89	84	1	320	416
	<i>Labor Income</i>	\$9.7	\$6.1	\$6.3	\$0.05	\$22.2	\$28.8
	<i>Output</i>	\$20.5	\$12.7	\$12.9	\$0.12	\$46.3	\$66.7
Right of Way	<i>Employment</i>	104	61	44	1	210	250
	<i>Labor Income</i>	\$2.3	\$1.5	\$1.4	\$0.01	\$5.2	\$7.9
	<i>Output</i>	\$15.9	\$9.5	\$8.9	\$0.09	\$34.4	\$42.6
Financial	<i>Employment</i>	36	20	17	0	73	118
	<i>Labor Income</i>	\$1.2	\$0.9	\$1.0	\$0.01	\$3.2	\$6.8
	<i>Output</i>	\$7.6	\$4.5	\$4.3	\$0.04	\$16.4	\$26.0
Electric Power	<i>Employment</i>	8	5	4	0	17	26
	<i>Labor Income</i>	\$0.6	\$0.4	\$0.4	\$0.00	\$1.4	\$2.1
	<i>Output</i>	\$3.3	\$1.9	\$1.9	\$0.02	\$7.0	\$9.3
Installation of Converters/Transformers	<i>Employment</i>	407	143	390	27	966	1302
	<i>Labor Income</i>	\$23.1	\$8.4	\$27.1	\$1.57	\$60.1	\$83.0
	<i>Output</i>	\$58.3	\$20.0	\$61.6	\$3.88	\$143.7	\$221.4
Manufacture Transformer	<i>Employment</i>	0	0	0	0	0	56
	<i>Labor Income</i>	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$3.7
	<i>Output</i>	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$12.6
Totals	<i>Employment</i>	2,340	1,315	1,450	38	5,143	8,255
	<i>Labor Income</i>	\$131.5	\$77.0	\$100.8	\$2.2	\$311.4	\$527.2
	<i>Output</i>	\$371.0	\$206.0	\$251.1	\$5.7	\$833.8	\$1,633.8

1. All monetary impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4. Assumes a three-year construction period.

The various figures reported in Table 3.21 for Kansas, Missouri, Illinois, Indiana, and the four-state region can be viewed as an upper bound on the impacts in question. Thus, for example, assuming 50 percent of all manufacturing-related activities (structures and wire) and 100 percent of all construction-

related activities directly tied to the transmission line are completed by in-state firms in Kansas, Missouri, Illinois, and Indiana, over the projected period the employment impact in the four-state region could potentially average approximately 5,143 jobs per year for three years. As shown in the last column of Table 3.21, when spending that occurs outside of the four-state region is accounted for, average employment impacts would increase to 8,255 jobs per year. Projected income impacts would be substantial as well. Assuming, once again, that 50 percent of manufacturing-related activities and 100 percent of construction-related activities are completed by in-state firms in each of the four states, over the projected period the labor income impact in the four-state region would average approximately \$311.4 million per year for three years. When spending occurring in the remainder of the country is accounted for, average labor income impacts would increase to \$527.2 million per year for three years.

3.6.2 Operations and Maintenance

Table 3.22 summarizes the annual impacts of operations and maintenance of the proposed transmission line at the state and national levels. Unlike the construction-related impacts, which would cease after the three-year construction period, the O&M impacts would be sustained for the foreseeable future as these recur on an annual basis.

Table 3.22: Estimated Annual O&M-Related Impacts¹ of the Grain Belt Express Clean Line in Kansas, Missouri, Illinois, Indiana, the Four-State Region, and the United States

Impact¹	Kansas	Missouri	Illinois	Indiana	Four-State Region	U.S.
Employment²	135	70	88	3	296	383
Labor Income³	\$7.6	\$4.1	\$6.1	\$0.19	\$18.0	\$24.0
Output	\$17.7	\$9.2	\$13.1	\$0.43	\$40.4	\$61.0

1. All monetary impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

3. Labor Income = Employee compensation + Proprietor income.

4 Economic Impacts of Associated Wind Farms

It is estimated that the Grain Belt Express Clean Line will connect approximately 4,000 MW of new wind farm capacity to the transmission grid. For this analysis, we assumed that the 4,000 MW will be built in western Kansas and comprise eight new wind farms. We further assumed that each wind farm will be 500 MW in size and entail construction costs of \$1,700 per kW and operation and maintenance costs of \$20 per kW. The JEDI model, which was used to estimate the economic impacts of construction of the new wind farms, contains default values that are used to allocate the construction and operation and maintenance costs to their component parts.

To estimate the economic impacts of the construction of the wind farms and the manufacture of the related components at the national and state levels, it is necessary to estimate the share of the wind turbine components that will be manufactured in the United States for the national impacts and the share of the components that will be manufactured in Kansas, Missouri, Illinois, and Indiana for the state analyses. The default values within the JEDI model were used for the local share of the operations and maintenance costs and the balance of plant costs. However, these default values were not used to estimate the local share of the manufacture of the larger components of a wind turbine – the nacelle, structure, blades, and transportation – which comprise 75 percent of the construction costs. Instead, we based the allocation on the American Wind Energy Association U.S. Wind Industry Annual Market Report 2012 conclusion that the domestic content of wind equipment (turbines, blades and structures) built in the United States rose to 67 percent in 2011. Blades and towers are easier to source and build domestically so it is reasonable to assume that a higher percentage of those components will be sourced domestically. Using 67 percent domestic content as a guideline, we assumed that 55 percent of the nacelles, 90 percent of the blades, and 90 percent of the structures will be produced in the United States. This yielded an overall cost-weighted average of domestic content of 66.56 percent. We assumed that 100 percent of the transportation is sourced within the United States.

To estimate the state-level economic impacts it was necessary to estimate the percentage of components that would be produced in each state. As is shown in Tables 4.1– 4.4, and as discussed more generally in the American Wind Energy Association U.S. Wind Industry Annual Market Report 2012, all four states have robust supply chains. Because it is impossible to know the identity and geographic location of the companies that will build the components for the proposed wind farms until they are actually built, we estimated the potential economic impacts of construction of the eight new wind farms using two different scenarios. Given the overall domestic content from the national model, we assumed that the four-state region would produce either 30 percent of the domestic content (low scenario) or 90 percent of the domestic content (high scenario) of the components that would go into construction of the new wind farms.

Table 4.1 : Major Kansas Wind Turbine Component Manufacturers

Company	Component
Atkinson Industries, Pittsburg, KS	Machining/Fabrication
Electromech Technologies, Wichita, KS	Distributed Wind Turbines Drive Train
Enertech Manufacturing, Newton, KS	Distributed Wind Turbines
J.R. Custom Metal Production, Wichita, KS	Power Transmission - Machining/ Fabrication
Jupiter Group, Junction City, KS	Material- Composites
Draka, Hutchinson, KS	Electrical Power Transmission
Siemens, Hutchinson, KS	Turbines

Table 4.2: Major Missouri Wind Turbine Component Manufacturers

Company	Component
ABB Inc., St. Louis, MO & Jefferson City, MO	Electrical
Able Manufacturing, Joplin, MO	Machining/Fabrication
AZZ Central Electric, Fulton, MO	Electrical Power Converter
CG Power Systems, Washington, MO	Power Transmission
Continental Disc Corporation, Liberty, MO	Power Transmission Brakes
FAG Bearings, Joplin, MO	Bearings
Lincoln Industrial, St. Louis, MO	Machinery
Nordic Windpower, Kansas City, MO	Turbines
Schaeffler Group, Joplin, MO	Bearings
Sika Corporation, Grandview, MO	Material - Composites
Vest- Fiber, Moberly, MO	Nacelle Components
Zoltek, St. Peters, MO	Composites

Table 4.3: Major Illinois Wind Turbine Component Manufacturers

Company	Component
Afton Chemical, Sauget, IL	Power Transmission/Lubricants
Aldridge Electric, Chicago, IL	Electrical/Power Transmission
Amico, Bourbonnais, IL	Power Transmission Machining/Fabrication
Armcell, Chicago, IL	Material Composites
Brad Foote Gear Works, Cicero, IL	Power Transmission Gears
Castrol, Naperville, IL	Power Transmission Lubricants
Centa Corp., Aurora, IL	Power Transmission Couplings
Chicago Industrial Fasteners Sugar Grove, Aurora, IL	Structural Fasteners
Coleman Cable, Waukegan, IL	Electrical Power Transmission
Deublin Company, Waukegan, IL	Electrical Generator Components
Earle M. Jorgenson Company, Schaumburg, IL	Material Steel
Excel Gear, Roscoe, IL	Power Transmission Gears
Finkl and Sons, Chicago, IL	Structural Castings
G&W Electric, Bolingbrook, IL	Electrical Power Transmission
Gleason, Rockford, IL	Equipment Manufacturing Machinery
Harger Lightning and Grounding, Grays Lake, IL	Equipment Other Equipment
Harting Inc., Elgin, IL	Electrical Power Transmission
Hydac Technology Corp, Glendale Height, IL	Power Transmission Hydraulics
Ingersoll Cutting Tools, Rockford, IL	Equipment Manufacturing Machinery
Ingersoll Machine Tools, Rockford, IL	Power Transmission Machining/Fabrication
NTN Bearings, Macomb, IL	Power Transmission Bearings
S&C Electric Company, Chicago, IL	Electrical Power Converter
Smalley Steel Ring Company, Lake Zurich, IL	Power Transmission Bearings
Southwire Company, Flora, IL	Wire & Cable
Specialty Metal Fabricators, Minonk, IL	Structural Steel Products
Stanley Machining & Tool, Hampshire, IL	Power Transmission Machining/Fabrication
Stanley Machining & Tool, Carpentersville, IL	Power Transmission Machining/Fabrication
Titan Tool Works, Carol, Stream, IL	Equipment, Construction
Trinity Structural Towers, Inc., Clinton, IL	Towers
Universal Steel, Crete, IL	Material Steel
Winergy, Elgin, IL	Gearboxes

Table 4.4: Major Indiana Wind Turbine Component Manufacturers

Company	Component
Ambassador Steel Corp., Auburn, IN	Material Steel
AOC LLC, Valparaso, IN	Composites
ATI Casting Service, La Porte, IN	Structural Castings
Bedford Machine & Tool, Bedford, IN	Power transmission Machining/Fabrication
Brevini Wind, Yorktown, IN	Gearboxes
Carlisle Industrial Brake and Friction, Bloomington, IN	Power transmission Brakes
Coleman Cable, Lafayette, IN	Electrical power transmission
Draka, Kouts, IN	Electrical
Global Blade Technology, Evansville, IN	Blades
Industrial Steel Construction, Gary, IN	Equipment Manufacturing machinery
Industrial Steel Construction, Heidtman Steel Products, IN	raw material supplier
KTR Corporation, Michigan City, IN	Power Transmission - coupling
NSK Americas, Franklin, IN	Power transmission - bearings
Oerlikon Fairfield, Lafayette, IN	gears
O'Neal Steel, Indianapolis, IN	steel products
Standard Locknut, Westfield, IN	Bearings
Transshield Inc., Elkhart, IN	Protective covers
Universal Steel America, Gary, IN	Structural/steel

In general, because the eight new wind farms will be located in Kansas, it is reasonable to assume that half of the domestically-sourced content would be produced in Kansas and that the remainder of the domestically sourced content would be evenly divided among the remaining three states. Combining this assumption with the assumed percentages of the different components that would be produced domestically and the 30 percent and 90 percent scenarios described above yields the percentages reported in Table 4.5, which summarizes the different scenarios that were estimated and the percentage of wind turbine components assumed to be produced in each state. For example, as shown in Table 4.5, under the 30 percent scenario, Kansas would produce 8.25 percent of the turbines (one half of 55 percent times 30 percent), while each of the remaining states would produce 2.75 percent of the turbines (one third of one half of 55 percent times 30 percent). However, certain states do not currently host a tower or blade manufacturer. Although it is possible that a manufacturer might build a new facility in such a state, we assumed no new facilities would be built in the relevant time frame. Currently, Kansas has no blade or tower manufacturers; Illinois has no blade manufacturer; and Missouri has no tower manufacturer. In each of these cases, we held the assumed four-state region supply share constant and shifted the assumed share from a state that had no manufacturer for that component to the remaining states in the region. Because the wind turbine nacelle has numerous component parts, we chose to keep the allocation the same even if a nacelle assembly plant was not located in a particular state.

Table 4.5: Baseline Scenarios for Location of Wind Turbine Components

Component	U.S.	Kansas		Missouri		Illinois		Indiana	
		30%	90%	30%	90%	30%	90%	30%	90%
Turbines	55%	8.25%	24.75%	2.75%	8.25%	2.75%	8.25%	2.75%	8.25%
Blades	90%	0.00%	0.00%	13.50%	40.50%	0.00%	0.00%	13.50%	40.50%
Structures	90%	0.00%	0.00%	0.00%	0.00%	13.50%	40.50%	13.50%	40.50%
Transportation	100%	15.0%	45.0%	5.00%	15.00%	5.00%	15.00%	5.00%	15.00%

4.1 Kansas

The economic impact in Kansas has two parts: the direct impact of the construction of the wind farms that are built in Kansas (4,000 MW) and the indirect and induced impacts that include the supply chain impacts. Table 4.6 displays the direct expenditure estimates from the JEDI model under the two scenarios outlined earlier for the 4,000 MW of wind farms built in Kansas. The only change that occurs among the scenarios is the amount of installed project costs that are spent in Kansas. Spending in Kansas is \$1.5 billion in the 30 percent scenario and \$2.2 billion in the 90 percent scenario. The JEDI model estimates annual operational expenses for the 4,000 MW of Kansas wind farms at \$1.1 billion. Total direct operating and maintenance costs amount to \$80 million, with \$21 million spent in Kansas. Taxes, financing costs, land leases and other expenses amount to \$1,046 million, with \$24 million spent in Kansas. The local spending in Kansas is determined by the JEDI model using its default values. These annual costs stay the same in the 30 percent and 90 percent scenario because the source of the equipment does not have an effect on the operations and maintenance costs.

Table 4.6: Kansas Direct Expenditure Estimates from JEDI Model for 4,000 MW of Kansas Wind Farms

	30% Scenario	90% Scenario
Installed Project Cost¹	\$6,800	\$6,800
Local (Kansas) Spending	\$1,522	\$2,194
Total Annual Operational Expenses (O&M, financing costs, lease payments, and taxes)	\$1,126	\$1,126
Direct Operating and Maintenance Costs	\$80	\$80
Local (Kansas) Spending	\$21	\$21
Other Annual Costs (Taxes, financing costs, land leases, etc.)	\$1,046	\$1,046
Local (Kansas) Spending	\$24	\$24

1. All spending is in millions of 2013 \$ and is rounded.

As shown in Table 4.7, in the 30 percent scenario, employment impacts during construction include 1,989 jobs for project development and on-site labor, 10,863 jobs due to turbine and supply chain impacts, and 2,690 jobs from induced impacts, for a total of 15,542 jobs. During the operating years, 181 on-site jobs will be created, local revenue and supply chain impacts will result in 242 jobs, and induced impacts will contribute another 104 jobs, resulting in a total of 528 new jobs. During construction, earnings will increase by a total of \$779 million and total output will increase by approximately \$2.3 billion. During the operating years, earnings will increase by \$25 million and total output will increase by \$73 million annually. As shown in Table 4.8, impacts increase to 19,656 new jobs and \$3.3 billion in output during construction under the 90 percent scenario.

Table 4.7: Kansas Wind Farms Economic Impacts from JEDI Model for 4,000 MW of Kansas Wind Farms – Summary Results for 30 Percent Scenario

Impacts ¹	Employment ²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	1,989	\$103.5	\$122.7
Turbine and Supply Chain Impacts	10,863	\$563.9	\$1,805.4
Induced Impacts	2,690	\$111.3	\$355.4
Total	15,542	\$778.8	\$2,283.5
During Operating Years (annual)			
Onsite Labor Impacts	181	\$9.3	\$9.3
Local Revenue and Supply Chain Impacts	242	\$11.3	\$50.2
Induced Impacts	104	\$4.3	\$13.7
Total	528	\$25.0	\$73.3

1. All monetary impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

Table 4.8: Kansas Wind Farms Economic Impacts from JEDI Model for 4,000 MW of Kansas Wind Farms – Summary Results for 90 Percent Scenario

Impacts ¹	Employment ²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	1,989	\$103.5	\$122.7
Turbine and Supply Chain Impacts	14,034	\$772.2	\$2,665.1
Induced Impacts	3,633	\$150.3	\$480.0
Total Impacts	19,656	\$1,026.1	\$3,267.7
During Operating Years (annual)			
Onsite Labor Impacts	181	\$9.3	\$9.3
Local Revenue and Supply Chain Impacts	242	\$11.3	\$50.2
Induced Impacts	104	\$4.3	\$13.7
Total Impacts	528	\$25.0	\$73.3

1. All monetary impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

Sections 4.2 – 4.4 describe the estimated impacts on the Missouri, Illinois, and Indiana economies that are attributable to the wind farms we assume would be built in Kansas as a result of the Grain Belt Express Clean Line transmission line. Because all of the wind farms are assumed to be built in Kansas, we consider only the supply chain aspects of the new wind farm capacity for Missouri, Illinois, and Indiana. The total direct expenditure estimates for the two scenarios (30 percent and 90 percent) are the same direct expenditures reported in Table 4.6. Once again, the only difference between the two scenarios is the amount of the project costs that are assumed to be spent in each of the three remaining states.

4.2 Missouri

As shown in Table 4.5, we assume that 2.75 percent of the turbine components, 13.5 percent of the blades and 5 percent of the transportation would be sourced from Missouri under the 30 percent scenario. In the 90 percent scenario, 8.25 percent of the turbine components, 40.5 percent of the blades, and 15 percent of the transportation would be sourced from Missouri. Referring to Table 4.9, total spending in Missouri would range from \$209 million under the 30 percent scenario to \$627 million under the 90 percent scenario.

Table 4.9: Missouri Direct Expenditure Estimates from JEDI Model for 4,000 MW of Wind Farms Built in Kansas

Expenditures ¹	30% Scenario	90% Scenario
Installed Project Cost	\$6,800	\$6,800
Local (Missouri) Spending	\$209	\$627
Total Annual Operational Expenses (O&M, financing costs, lease payments, and taxes)	\$1,134	\$1,134
Direct Operating and Maintenance Costs	\$80	\$80
Local (Missouri) Spending	\$0	\$0
Other Annual Costs (Taxes, financing costs, land leases, etc.)	\$1,054	\$1,054
Local (Missouri) Spending	\$0	\$0

1. All spending is in millions of 2013 \$ and is rounded.

Tables 4.10 and 4.11 summarize the estimated impacts in Missouri under the 30 percent and 90 percent scenarios. Estimated employment impacts range from approximately 1,311 to 3,933 jobs, and output impacts range from \$329 million to \$987 million. There are no operating year impacts because the wind farms are assumed to be located outside of Missouri.

Table 4.10: Missouri Supply Chain Economic Impacts from JEDI Model for 4,000 MW of Wind Farms Built in Kansas – Summary Results for 30 Percent Scenario

Impacts ¹	Employment ²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	0	\$0	\$0
Turbine and Supply Chain Impacts	980	\$65.3	\$284.3
Induced Impacts	331	\$14.5	\$44.7
Total Impacts	1,311	\$79.8	\$329.0

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.

Table 4.11: Missouri Supply Chain Economic Impacts from JEDI Model for 4,000 MW of Wind Farms Built in Kansas – Summary Results for 90 Percent Scenario

Impacts ¹	Employment ²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	0	\$0	\$0
Turbine and Supply Chain Impacts	2,939	\$196.0	\$852.9
Induced Impacts	994	\$43.5	\$134.0
Total Impacts	3,933	\$239.5	\$986.9

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.

4.3 Illinois

As shown in Table 4.5, we assume that 2.75 percent of the turbine components, 13.5 percent of the structures, and 5 percent of the transportation would be sourced from Illinois under the 30 percent scenario. For the 90 percent scenario, 8.25 percent of the turbine components, 40.5 percent of the structures, and 15 percent of the transportation would be sourced in Illinois. Referring to Table 4.12, total spending in Illinois in each of these scenarios would range from \$218 million under the 30 percent scenario to \$654 million under the 90 percent scenario.

Table 4.12: Illinois Direct Expenditure Estimates from JEDI Model for 4,000 MW of Wind Farms Built in Kansas

Expenditures ¹	30% Scenario	90% Scenario
Installed Project Cost	\$6,800	\$6,800
Local (Illinois) Spending	\$218	\$654
Total Annual Operational Expenses (O&M, financing costs, lease payments, and taxes)	\$1,142	\$1,142
Direct Operating and Maintenance Costs	\$80	\$80
Local (Illinois) Spending	\$0	\$0
Other Annual Costs (Taxes, financing costs, land leases, etc.)	\$1,062	\$1,062
Local (Illinois) Spending	\$0	\$0

1. All spending is in millions of 2013 \$ and is rounded.

Tables 4.13 and 4.14 summarize the estimated impacts in Illinois under the 30 percent and 90 percent scenarios. Estimated employment impacts range from approximately 1,471 to 4,412 jobs, and output impacts range from \$381 million to \$1.14 billion. There are no operating year impacts because the wind farms are assumed to be located outside of Illinois.

Table 4.13: Illinois Supply Chain Economic Impacts from JEDI Model for 4,000 MW of Wind Farms Built in Kansas – Summary Results for 30 Percent Scenario

Impacts ¹	Employment ²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	0	\$0	\$0
Turbine and Supply Chain Impacts	1,061	\$81.6	\$315.4
Induced Impacts	410	\$22.4	\$65.7
Total Impacts	1,471	\$104.0	\$381.1

1. All monetary impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

Table 4.14: Illinois Supply Chain Economic Impacts from JEDI Model for 4,000 MW of Wind Farms Built in Kansas – Summary Results for 90 Percent Scenario

Impacts ¹	Employment ²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	0	\$0	\$0
Turbine and Supply Chain Impacts	3,182	\$244.7	\$946.3
Induced Impacts	1,230	\$67.2	\$197.1
Total Impacts	4,412	\$311.9	\$1,143.4

1. All monetary impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

4.4 Indiana

As shown in Table 4.5, we assume that 2.75 percent of the turbine components, 13.5 percent of the blades, 13.5 percent of the structures, and 5 percent of the transportation would be sourced from Indiana under the 30 percent scenario. In the 90 percent scenario, 8.25 percent of the turbine components, 40.5 percent of the blades, 40.5 percent of the structures, and 15 percent of the transportation would be sourced from Indiana. Referring to Table 4.15, total spending in Indiana in each of these scenarios would range from \$316 million under the 30 percent scenario to \$949 million under the 90 percent scenario.

Table 4.15: Indiana Direct Expenditure Estimates from JEDI Model for 4,000 MW of Wind Farms Built in Kansas

Expenditures ¹	30% Scenario	90% Scenario
Installed Project Cost	\$6,800	\$6,800
Local (Indiana) Spending	\$316	\$949
Total Annual Operational Expenses (O&M, financing costs, lease payments, and taxes)	\$1,178	\$1,178
Direct Operating and Maintenance Costs	\$80	\$80
Local (Indiana) Spending	\$0	\$0
Other Annual Costs (Taxes, financing costs, land leases, etc.)	\$1,098	\$1,098
Local (Indiana) Spending	\$0	\$0

1. All spending is in millions of 2013 \$ and is rounded.

Tables 4.16 and 4.17 summarize the estimated impacts in Indiana under the 30 percent and 90 percent scenarios. Estimated employment impacts range from approximately 1,872 to 5,617 jobs, and output impacts range from \$472 million to \$1.42 billion. There are no operating year impacts because the wind farms are assumed to be located outside of Indiana.

Table 4.16: Indiana Supply Chain Economic Impacts from JEDI Model for 4,000 MW of Wind Farms Built in Kansas – Summary Results for 30 Percent Scenario

Impacts ¹	Employment ²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	0	\$0	\$0
Turbine and Supply Chain Impacts	1,398	\$94.3	\$412.2
Induced Impacts	475	\$19.2	\$60.3
Total Impacts	1,872	\$113.5	\$472.5

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.

Table 4.17: Indiana Supply Chain Economic Impacts from JEDI Model for 4,000 MW of Wind Farms Built in Kansas – Summary Results for 90 percent Scenario

Impacts ¹	Employment ²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	0	\$0	\$0
Turbine and Supply Chain Impacts	4,193	\$283.0	\$1,236.7
Induced Impacts	1,424	\$57.5	\$180.8
Total Impacts	5,617	\$340.6	\$1,417.5

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.

4.5 United States

To estimate impacts at the national level, we assumed that 55 percent of the nacelles, 90 percent of the blades, and 90 percent of the structures would be manufactured in the United States along with 100 percent of the transportation for all 4,000 MW of new generating capacity. Table 4.18 summarizes the resulting direct expenditure estimates.

Table 4.18: United States Direct Expenditure Estimates from JEDI Model of 4,000 MW of Wind Farms

Expenditure ¹	Amount
Installed Project Cost	\$6,800
Local (U.S.) Spending	\$5,269
Total Annual Operational Expenses (O&M, financing costs, lease payments, and taxes)	\$1,144
Direct Operating and Maintenance Costs	\$80
Local (U.S.) Spending	\$52
Other Annual Costs (Taxes, financing costs, land leases, etc.)	\$1,064
Local (U.S.) Spending	\$1,064

1. All spending is in millions of 2013 \$ and is rounded.

Table 4.19 summarizes the national economic impacts resulting from the 4,000 MW of wind farms. During construction, approximately 71,075 jobs will be created and during the operating years, 3,360 jobs will be created. Total output is predicted to increase by approximately \$15.1 billion during construction and \$981 million during operation.

Table 4.19: United States Direct Expenditure Estimates from JEDI Model of 4,000 MW of Wind Farms – Summary Results

Impacts¹	Employment²	Earnings	Output
During Construction Period			
Project Development and Onsite Labor Impacts	3,157	\$219.5	\$271.7
Turbine and Supply Chain Impacts	39,524	\$2,691.7	\$10,024.3
Induced Impacts	28,394	\$1,510.5	\$4,864.6
Total Impacts	71,075	\$4,421.7	\$15,160.5
During Operating Years (annual)			
Onsite Labor Impacts	200	\$11.3	\$11.3
Local Revenue and Supply Chain Impacts	1,342	\$82.7	\$658.5
Induced Impacts	1,818	\$96.7	\$311.5
Total Impacts	3,360	\$190.7	\$981.4

1. All monetary impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents.

5 Fiscal Impacts: Transmission Line Construction and Operations

The IMPLAN model was also used to estimate various tax-related impacts of a projected increase in final demand in the economy. The tax impacts considered here include individual income tax, corporate income tax, and sales tax revenues in Kansas, Missouri, Illinois, and Indiana attributable to the manufacture of required components and construction of that segment of the Grain Belt Express Clean Line that will be located in each state. The impacts reported here do not reflect any specific tax-related incentives that any one of the states might offer to Clean Line.

5.1 Manufacturing and Construction

Projected increases in tax revenues in Kansas, Missouri, Illinois, and Indiana attributable to increased spending on manufacturing of structures and wire; construction of the transmission line; installation of a transformer; the payment of fees for the required right-of-way, architectural, and financial services; and the purchase of electric power associated with the line are summarized in Tables 5.1 – 5.4.

5.1.1 Kansas

As shown in Table 5.1, it is estimated that the direct, indirect, and induced impacts resulting from the manufacturing and construction of that segment of the Grain Belt Express Clean Line located in Kansas would yield \$8.47 million in income taxes paid by individuals, \$1.17 million in corporate income taxes, and \$10.64 million in sales tax revenues over the three-year construction period. This translates to an average annual increase in tax revenues attributable to these three revenue streams of \$6.76 million per year over the three-year period.

Table 5.1: Estimated Fiscal Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Kansas

Component	Individual Income Tax ¹	Corporate Income Tax	Sales Tax	Total	Annual Average ²
Installation of Structures	\$5.06	\$0.53	\$6.23	\$11.82	\$3.94
Manufacture Structures	\$0.78	\$0.13	\$1.15	\$2.06	\$0.69
Manufacture Wire	\$0.26	\$0.06	\$0.38	\$0.70	\$0.23
Architectural Services	\$0.62	\$0.05	\$0.65	\$1.32	\$0.44
Right of Way	\$0.15	\$0.20	\$1.59	\$1.94	\$0.65
Financial	\$0.08	\$0.02	\$0.18	\$0.28	\$0.09
Electric Power	\$0.04	\$0.03	\$0.45	\$0.52	\$0.17
Installation of Converter	\$1.49	\$0.16	\$0.00 ³	\$1.64	\$0.55
Totals	\$8.47	\$1.17	\$10.64	\$20.28	\$6.76

1. All impacts are in millions of 2013 \$ and are rounded.

2. Assumes a three-year construction period.

3. Sales taxes from converter installation are set at 0 on the assumption that the converter stations might qualify for a tax relief exemption.

5.1.2 Missouri

As shown in Table 5.2, it is estimated that the direct, indirect, and induced impacts resulting from the manufacturing and construction of that segment of the Grain Belt Express Clean Line located in Missouri would yield \$4.19 million in income taxes paid by individuals, \$280 thousand in corporate income taxes, and \$6.75 million in sales tax revenues over the three-year construction period. This translates to an average annual increase in tax revenues attributable to these three revenue streams of \$3.74 million per year over the three-year period.

Table 5.2: Estimated Fiscal Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Missouri

Component	Individual Income Tax ¹	Corporate Income Tax	Sales Tax	Total	Annual Average ²
Installation of Structures	\$2.68	\$0.13	\$3.96	\$6.77	\$2.26
Manufacture Structures	\$0.43	\$0.03	\$0.78	\$1.24	\$0.41
Manufacture Wire	\$0.13	\$0.01	\$0.25	\$0.40	\$0.13
Architectural Services	\$0.33	\$0.01	\$0.43	\$0.78	\$0.26
Right of Way	\$0.08	\$0.05	\$0.94	\$1.07	\$0.36
Financial	\$0.05	\$0.01	\$0.14	\$0.20	\$0.07
Electric Power	\$0.02	\$0.01	\$0.25	\$0.28	\$0.09
Installation of Converter	\$0.46	\$0.02	\$0.00	\$0.48	\$0.16
Totals	\$4.19	\$0.28	\$6.75	\$11.22	\$3.74

1. All impacts are in millions of 2013 \$ and are rounded.

2. Assumes a three-year construction period.

3. Sales taxes from converter installation are set at 0 on the assumption that the converter stations might qualify for a tax relief exemption.

5.1.3 Illinois

As shown in Table 5.3, it is estimated that the direct, indirect, and induced impacts resulting from the manufacturing and construction of that segment of the Grain Belt Express Clean Line located in Illinois would yield \$4.18 million in income taxes paid by individuals, \$1.12 million in corporate income taxes, and \$6.48 million in sales tax revenues over the three-year construction period. This translates to an average annual increase in tax revenues attributable to these three revenue streams of \$3.93 million per year over the three-year period.

Table 5.3: Estimated Fiscal Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Illinois

Component	Individual Income Tax ¹	Corporate Income Tax	Sales Tax	Total	Annual Average ²
Installation of Structures	\$2.18	\$0.45	\$3.78	\$6.41	\$2.14
Manufacture Structures	\$0.36	\$0.12	\$0.76	\$1.24	\$0.41
Manufacture Wire	\$0.14	\$0.06	\$0.25	\$0.45	\$0.15
Architectural Services	\$0.26	\$0.05	\$0.41	\$0.71	\$0.24
Right of Way	\$0.06	\$0.16	\$0.90	\$1.12	\$0.37
Financial	\$0.04	\$0.03	\$0.14	\$0.21	\$0.07
Electric Power	\$0.02	\$0.02	\$0.25	\$0.28	\$0.09
Installation of Converter	\$1.12	\$0.23	\$0.00	\$1.35	\$0.45
Totals	\$4.18	\$1.12	\$6.48	\$11.78	\$3.93

1. All impacts are in millions of 2013 \$ and are rounded.

2. Assumes a three-year construction period.

3. Sales taxes from converter installation are set at 0 on the assumption that the converter stations might qualify for a tax relief exemption.

5.1.4 Indiana

As shown in Table 5.4, it is estimated that the direct, indirect, and induced impacts resulting from the manufacturing and construction of that segment of the Grain Belt Express Clean Line located in Indiana would yield \$143 thousand in income taxes paid by individuals, \$15 thousand in corporate income taxes, and \$63 thousand in sales tax revenues over the three-year construction period. This translates to an average annual increase in tax revenues attributable to these three revenue streams of \$74 thousand per year over the three-year period.

Table 5.4: Estimated Fiscal Impacts of Manufacturing and Construction of Grain Belt Express Clean Line in Indiana

Component	Individual Income Tax ¹	Corporate Income Tax	Sales Tax	Total	Annual Average ²
Installation of Structures	\$0.030	\$0.003	\$0.037	\$0.069	\$0.023
Manufacture Structures	\$0.005	\$0.001	\$0.007	\$0.012	\$0.004
Manufacture Wire	\$0.002	\$0.000	\$0.002	\$0.004	\$0.001
Architectural Services	\$0.004	\$0.000	\$0.004	\$0.008	\$0.003
Right of Way	\$0.001	\$0.001	\$0.009	\$0.011	\$0.004
Financial	\$0.000	\$0.000	\$0.001	\$0.002	\$0.001
Electric Power	\$0.000	\$0.000	\$0.003	\$0.003	\$0.001
Installation of Transformer	\$0.102	\$0.010	\$0.000	\$0.112	\$0.037
Totals	\$0.143	\$0.015	\$0.063	\$0.221	\$0.074

1. All impacts are in millions of 2013 \$ and are rounded.

2. Assumes a three-year construction period.

3. Sales taxes from transformer installation are set at 0 on the assumption that the transformer station might qualify for a tax relief exemption.

5.2 Operations and Maintenance

As we discussed in Section 3, once the transmission line is built and is in operation, O&M costs will contribute \$10.0 million of additional spending to the Kansas economy each year. The corresponding amounts for Missouri, Illinois, and Indiana are \$5.0 million, \$7.0 million, and \$0.2 million, respectively. The estimated tax-related impacts of annual O&M expenditures in each state are summarized in Tables 5.5 – 5.8.

5.2.1 Kansas

Referring to Table 5.5, in Kansas annual individual income tax revenues, corporate income taxes, and sales tax revenues are predicted to amount to \$162 thousand, \$16 thousand, and \$201 thousand per year, respectively. The combined total is \$379 thousand in additional tax revenues each year.

5.2.2 Missouri

Referring to Table 5.6, in Missouri annual individual income tax revenues, corporate income taxes, and sales tax revenues are predicted to amount to \$74 thousand, \$4 thousand, and \$111 thousand per year, respectively. The combined total is \$189 thousand in additional tax revenues each year.

5.2.3 Illinois

Referring to Table 5.7, in Illinois annual individual income tax revenues, corporate income taxes, and sales tax revenues are predicted to amount to \$84 thousand, \$17 thousand, and \$146 thousand per year, respectively. The combined total is \$247 thousand in additional tax revenues each year.

Table 5.5: Estimated Annual Fiscal Impacts of Grain Belt Express Clean Line O&M Expenditures in Kansas

Impact ¹	Total
Individual Income Tax	\$0.162
Corporate Income Tax	\$0.016
Sales Tax	\$0.201
Total	\$0.379

1. All impacts are in millions of 2013 \$ and are rounded.

Table 5.6: Estimated Annual Fiscal Impacts of Grain Belt Express Clean Line O&M Expenditures in Missouri

Impact ¹	Total
Individual Income Tax	\$0.074
Corporate Income Tax	\$0.004
Sales Tax	\$0.111
Total	\$0.189

1. All impacts are in millions of 2013 \$ and are rounded.

Table 5.7: Estimated Annual Fiscal Impacts of Grain Belt Express Clean Line O&M Expenditures in Illinois

Impact ¹	Total
Individual Income Tax	\$0.084
Corporate Income Tax	\$0.017
Sales Tax	\$0.146
Total	\$0.247

1. All impacts are in millions of 2013 \$ and are rounded.

5.2.1 Indiana

Referring to Table 5.8, in Indiana annual individual income tax revenues and sales tax revenues are predicted to amount to \$4 thousand and \$5 thousand per year, respectively. The combined total is \$9 thousand in additional tax revenues each year.

Table 5.8: Estimated Annual Fiscal Impacts of Grain Belt Express Clean Line O&M Expenditures in Indiana

Impact¹	Total
Individual Income Tax	\$0.004
Corporate Income Tax	\$0.000
Sales Tax	\$0.005
Total	\$0.009

1. All impacts are in millions of 2013 \$ and are rounded.

6 Summary of Economic Impacts

The construction of the proposed Grain Belt Express Clean Line has the potential to yield substantial economic impacts in Kansas, Missouri, Illinois, Indiana, and the nation over the projected three-year construction period. Referring to Table 6.1, manufacturing of structures and wire and construction of the line could potentially increase employment by approximately 2,340 jobs in Kansas, 1,315 jobs in Missouri, 1,450 jobs in Illinois, and 38 jobs in Indiana in each year of the three-year construction period. Labor income would increase \$131.5 million per year in Kansas, \$77 million in Missouri, \$100.8 million in Illinois, and \$2.2 million in Indiana during the same time frame.

Table 6.1: Estimated Annual Average Manufacturing- and Construction-Related Impacts of the Grain Belt Express Clean Line in Kansas, Missouri, Illinois, Indiana, and the United States

Impact ^{1, 2}	Kansas	Missouri	Illinois	Indiana	U.S.
Employment	2,340	1,315	1,450	38	8,255
Labor Income	\$131.5	\$77.0	\$100.8	\$2.2	\$527.2
Output	\$371.0	\$206.0	\$251.1	\$5.7	\$1,633.8

1. All impacts are in millions of 2013 \$ and are rounded.

2. Assumes a three-year construction period

Once completed, operation and maintenance of the line would continue to yield economic benefits to each state. Referring to Table 6.2, potential annual employment impacts in Kansas include 143 jobs and \$6 million in labor income. Missouri could see an additional 70 jobs and \$4.1 million of labor income each year. The corresponding totals in Illinois are 88 jobs and \$6.1 million in additional labor income. In Indiana, there would be 3 additional jobs and \$190 thousand in additional labor income.

Table 6.2: Estimated Annual O&M-Related Impacts¹ of the Grain Belt Express Clean Line in Kansas, Missouri, Illinois, Indiana, and the United States

Impact ¹	Kansas	Missouri	Illinois	Indiana	U.S.
Employment²	135	70	88	3	383
Labor Income³	\$7.6	\$4.1	\$6.1	\$0.19	\$24.0
Output	\$17.7	\$9.2	\$13.1	\$0.43	\$61.0

1. All monetary impacts are in millions of 2013 \$ and are rounded.

2. All employment figures are full time equivalents

3. Labor Income = Employee compensation + Proprietor income

Table 6.3 lists fiscal impacts attributable to manufacture and construction of the transmission line. Tax revenues from the sources listed there could amount to \$6.76 million in Kansas, \$3.74 million in Missouri, \$3.93 million in Illinois, and \$74 thousand in Indiana each year of the three-year period.

Table 6.3: Estimated Annual¹ Fiscal Impacts² of Construction of Grain Belt Express Clean Line in 4-State Region

Impact	Kansas	Missouri	Illinois	Indiana
Individual Income Tax	\$2.82	\$1.40	\$1.39	\$0.048
Corporate Income Tax	\$0.39	\$0.09	\$0.37	\$0.005
Sales Tax	\$3.55	\$2.25	\$2.16	\$0.021
Total	\$6.76	\$3.74	\$3.93	\$0.074

1. Construction period = 3 years

2. All monetary impacts are in millions of 2013 \$ and are rounded.

Finally, as shown in Table 6.4, annual tax revenues from the sources listed there resulting from operation and maintenance of the line could amount to \$379 thousand in Kansas, \$189 thousand in Missouri, \$247 thousand in Illinois, and 9 thousand in Indiana.

Table 6.4: Summary of Estimated Annual Fiscal Impacts¹ of O&M Expenditures

	Kansas	Missouri	Illinois	Indiana
Individual Income Tax	\$0.162	\$0.074	\$0.084	\$0.004
Corporate Income Tax	\$0.016	\$0.004	\$0.017	\$0.000
Sales Tax	\$0.201	\$0.111	\$0.146	\$0.005
Total	\$0.379	\$0.189	\$0.247	\$0.009

1. All monetary impacts are in millions of 2013 \$ and are rounded.

The construction of additional wind farms which the proposed transmission line is expected to stimulate has the

Table 6.5: Kansas Wind Farms Economic Impacts

Impacts ¹	Employment ²	Earnings	Output
Total Construction Impacts 30% Scenario	15,542	\$778.8	\$2,283.5
Total Construction Impacts 90% Scenario	19,656	\$1,026.1	\$3,267.7
Total Operating Year Impacts – All Scenarios	528	\$25.0	\$73.3

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.

potential to result in significant economic impacts as well. Table 6.5 summarizes the estimated total economic impacts during the construction period in Kansas under the 30 percent and 90 percent scenarios. The potential total employment impacts during construction range from 15,542 to 19,656 jobs, with output expanding by \$2.2 billion to \$3.3 billion under the 30 percent and 90 percent scenarios, respectively. We also estimate that during operations, the wind farms built in Kansas would result in 528 jobs, \$25 million in earnings, and \$73 million in output annually.

While Missouri, Illinois and Indiana would experience smaller overall impacts than Kansas because the new wind farms would not be built in those states, substantial economic benefits would still accrue to those states.

Table 6.6: Missouri, Illinois, and Indiana Wind Farms Economic Impacts

State	Total Construction Impacts ¹	Employment ²	Earnings	Output
Missouri	30% Scenario	1,311	\$79.8	\$329.0
	90 % Scenario	3,933	\$239.5	\$986.9
Illinois	30% Scenario	1,471	\$104.0	\$381.1
	90 % Scenario	4,412	\$311.9	\$1,143.4
Indiana	30% Scenario	1,872	\$113.5	\$472.5
	90 % Scenario	5,617	\$340.6	\$1,417.5

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.

As shown in Table 6.6, the total employment impacts of supply chain effects during construction would range from 1,311 to 3,933 jobs in Missouri, from 1,471 to 4,412 in Illinois and from 1,872 to 5,617 in Indiana.

Finally, the economic impacts of the wind farms on the United States as a whole are summarized in Table 6.7. Construction of the wind farms could result in 71,075 jobs, \$4.4 billion in earnings, and \$15.2 billion in output. Operation of the new wind farms could generate approximately 3,360 jobs, \$191million in earnings, and \$981 million in output annually.

Table 6.7: National Economic Impacts of Wind Farm Construction and Operation

Total Impacts ¹	Employment ²	Earnings	Output
Construction Impacts	71,075	\$4,421.7	\$15,160.5
Annual Operating Impacts	3,360	\$190.7	\$981.4

1. All monetary impacts are in millions of 2013 \$ and are rounded.
2. All employment figures are full time equivalents.

APPENDIX

Qualifications

Dr. David G. Loomis

Dr. David G. Loomis is president of Strategic Economic Research, LLC and Professor of Economics at Illinois State University where he teaches in the Master's Degree program in electricity, natural gas and telecommunications economics. Dr. Loomis is Director of the Center for Renewable Energy and Executive Director of the Institute for Regulatory Policy Studies. As part of his duties, he leads the Illinois Wind Working Group under the U.S. Department of Energy. Dr. Loomis is part of a team of faculty that has designed a new undergraduate curriculum in renewable energy at Illinois State University. Dr. Loomis earned his Ph.D. in economics at Temple University.

Dr. Loomis co-authored several industry reports relevant to this report, including *The Economic Impact of Wind Energy in Illinois* (co-authored with Sarah Noll and Jared Hayden, 2012) and *The Economic Impact of the Wind Turbine Supply Chain in Illinois* (co-authored with J. Lon Carlson and James E. Payne, 2010).

Prior to joining the faculty at Illinois State University, Dr. Loomis worked at Bell Atlantic (Verizon) for 11 years. He has published articles in the *Energy Policy*, *Energy Economics*, *Electricity Journal*, *Review of Industrial Organization*, *Utilities Policy*, *Information Economics and Policy*, *International Journal of Forecasting*, *International Journal of Business Research*, *Business Economics* and the *Journal of Economics Education*.

Dr. J. Lon Carlson

Dr. J. Lon Carlson is an independent consultant who recently retired as an Associate Professor in the Department of Economics at Illinois State University and Director of Outreach for the Institute for Regulatory Policy Studies. His research on energy issues and environmental economics has appeared in several outlets, including *The Electricity Journal*, *Energy Policy*, *Natural Resources Journal*, *the Boston College Environmental Affairs Law Review*, *the Journal of the Air and Waste Management Association*, and *the Journal of Applied Economics Letters*.

Dr. Carlson has also co-authored several economic impact analyses that utilized the IMPLAN model, including *The Economic Impact of the Wind Turbine Supply Chain in Illinois* (co-authored with David G. Loomis and James E. Payne, 2010) and was a principal author of an Environmental Impact Statement that was completed for Western Area Power Administration by Argonne National Laboratory in 1995. Dr. Carlson has held positions at Argonne National Laboratory and the U.S. Government Accountability Office, and has worked as a consultant for a number of government agencies. He received his Ph.D. in Economics from the University of Illinois at Urbana-Champaign in 1984.