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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. EA-2014-0207

DIRECT TESTIMONY OF

DR. DAVID G. LOOMIS

ON BEHALF OF

GRAIN BELT EXPRESS CLEAN LINE LLC

March 26, 2014

GBE Exhibit No. 114
Date 11-21-14 Reporter KF
File No. EA-2014-0207

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I. INTRODUCTION

Q. Please state your name, present position and business address.

A. My name is David G. Loomis. I am Principal of Strategic Economic Research, LLC, Professor of Economics at Illinois State University, Director of the Center for Renewable Energy, and Executive Director of the Institute for Regulatory Policy Studies. My business address is 2705 Kolby Court, Bloomington, IL 61704.

Q. Please describe your education and professional background.

A. I received a Bachelor of Arts degree in economics and mathematics and a Doctor of Philosophy degree in economics from Temple University. I achieved the rank of full Professor at Illinois State University in 2010. I am a member of the Steering Committee and Chair of the Transmission and Economic Development Workgroup at the Great Lakes Wind Collaborative.

As part of my duties as Professor of Economics at Illinois State University, I teach and oversee the course sequence in Electricity, Natural Gas and Telecommunications Economics within the Applied Economics Master's Degree Program. I have been teaching classes that cover transmission markets, cost allocation and pricing for over 15 years, including Economics of Regulation and Antitrust, Economics of Energy, and Industry Studies in Electricity, Natural Gas and Telecommunications Economics. I was part of the team of three faculty members that created a unique undergraduate degree program in renewable energy at Illinois State University. I have authored or co-authored 25 publications in peer-reviewed publications such as *Energy Policy, Energy Economics, Electricity Journal,* and *Applied Energy.* I have also co-authored several reports on the economic impact of wind farms (*Economic*

Impact of Wind Energy Development in Illinois 2009, 2010, 2011; Illinois Wind Turbine Supply Chain Report 2010).

I have received numerous professional awards including the 2011 Midwestern Regional Wind Advocacy Award from the U.S. Department of Energy's Wind Powering America, the 2009 Economics Department Scott M. Elliott Faculty Excellence Award, the Illinois State University Million Dollar Club in 2009 (awarded to faculty who received over $1 million in grants), and the 2008 Outstanding State Wind Working Group Award. My full curriculum vitae is provided in **Schedule DGL-1** to this testimony.

Q. What is the purpose of your direct testimony?

A. I am testifying in support of the request of Grain Belt Express Clean Line LLC ("Grain Belt Express" or "Company") to be issued a certificate of convenience and necessity to construct, operate and maintain the Grain Belt Express Clean Line transmission project ("Grain Belt Express Project" or "Project") and to operate as a public utility in Missouri. I will address the economic impact of the proposed Project on the Missouri economy. My colleague Dr. J. Lon Carlson and I performed a study to estimate the economic impact of the project. The analysis shows that the Project itself will result in 1,315 Missouri jobs per year during three-year construction of the Project and 70 long term Missouri jobs during ongoing operations. In addition, the Project will enable an estimated 4,000 megawatts ("MW") of wind farms to be built that will result in an additional 1,311 to 3,933 Missouri jobs in manufacturing and associated industries. The full report of the study that we performed is provided in **Schedule DGL-2** to my testimony.

II. SUMMARY OF RESULTS OF ECONOMIC IMPACT STUDY

Q. What economic impacts of the Grain Belt Express Project did your study assess?

A. The study estimated the economic impacts of the Project in two parts: (1) the economic impact of the Project itself and (2) the economic impact of the wind farms that this Project will enable to be built. For both the Project and the new wind generation facilities, the study measured the economic impact of the construction itself, as well as the economic impact of their ongoing operations and maintenance ("O&M").

Q. What does the study estimate will be the economic impact of the construction of the Grain Belt Express Project?

A. The study estimates that the construction of the Project itself will—when considering the production of inputs to the line such as towers, wire, and real estate services—create a demand for approximately 1,315 construction jobs per year for three years in Missouri. Labor income will increase by $77.0 million per year in Missouri for three years. Overall output will increase by $206.0 million per year in Missouri for three years.

Q. What Missouri companies will be involved in the construction of the Grain Belt Express Project?

A. The Company has already signed agreements with three Missouri-based manufacturers to supply parts of the Project: ABB Inc. ("ABB"), General Cable Industries, Inc. ("General Cable"), and Hubbell Power Systems, Inc. ("Hubbell"). ABB Inc. is the Company's preferred supplier to manufacture alternating current transformers for the collector system. ABB plans to manufacture the transformers in its St. Louis facility. In addition, General Cable will manufacture the steel core for the transmission line conductor at its Sedalia facility. Finally, Hubbell is the preferred supplier of insulators and hardware for the Project, and will manufacture the hardware and the core of the polymer insulators at its Centralia facility.

Q. What does the study estimate will be the economic impact of the ongoing operations and maintenance of the Grain Belt Express Project?

A. The study estimates that the economic impact of the annual O&M costs of the Project, which will be incurred when the line is placed into service and operating, will be 70 jobs and $4.1 million of labor income in Missouri annually. Overall output will increase by $9.2 million annually in Missouri.

Q. What does the study estimate will be the fiscal impacts of the Grain Belt Express Project?

A. The study estimated certain tax-related impacts of the projected increases in final demand in the four-state region. The tax impacts considered here include individual income tax, corporate income tax, and sales tax receipts. The study estimated that revenues from income taxes paid by individuals and by corporations in Missouri would total $4.19 million and $280,000, per year, respectively, over the three-year construction period. Sales tax revenues would yield an additional $6.75 million bringing the total tax revenue to $11.22 million over the three-year construction period.

As previously noted, once the transmission line is built and is in operation, O&M costs will contribute additional spending to the Missouri economy each year. Individual income tax, corporate income tax, and sales tax receipts resulting from O&M expenditures are predicted to yield approximately $189,000 per year in Missouri tax receipts.

Q. What does the study estimate will be the economic impact of the construction of the wind farms that the Grain Belt Express Project will enable to be built?

A. The Grain Belt Express Project is expected to stimulate the development of approximately 4,000 MW of wind farms in Kansas. In our study, the larger components of a wind turbine—the nacelle[1], tower, blades, and transportation—were examined in detail. Using information from the American Wind Energy Association's U.S. Wind Industry Annual Market Report 2012, we estimated that 55% of the nacelles, 90% of the blades, and 90% of the towers used to construct wind farms will be made in the United States. The Jobs and Economic Development ("JEDI") model of the U.S. Department of Energy's National Renewable Energy Laboratory ("NREL") was used to estimate the economic impacts of the wind farms. The JEDI model contains default values for how construction and O&M costs are allocated to the component parts of a wind generation facility. The default values in the JEDI model were used for the balance of plant components and for O&M costs.

As a result of the increase in development of wind generating facilities that will be stimulated and enabled by the Grain Belt Express Project, there will be economic benefits, including both direct expenditures to build wind farms and supply chain impacts due to increased demand. To estimate the state-level economic impacts of the new wind generation facilities, it was necessary to estimate the percentage of the wind turbine components that would be produced in each state. To define the range of benefits to Missouri and the other three states the Project traverses, we constructed two different scenarios. In the first scenario, this four-state region (Missouri, Kansas, Illinois and

[1] A nacelle is the part of a wind turbine that sits at the top of the tower and contains the gearbox and electric generating equipment.

Indiana) supplies 30% of the total domestic content of the wind turbines connected to the Project. In the second scenario, the same region supplies 90% of the domestic content of the turbines.

Q. What does the study estimate will be the economic impact in Missouri of the construction of the wind farms that the Project will enable to be built under the two scenarios?

A. While no wind farms are assumed to be built in Missouri as a direct result of the Grain Belt Express Project, the state will experience supply chain impacts attributable to the construction of wind farms in Kansas due to the Project. Based on my review of manufacturing firms located in Missouri, these firms supply many components used in the wind turbine supply chain. For example, Schaeffler Group USA Inc. in Joplin manufactures bearing arrangements for wind turbines; Able Manufacturing & Assembly, LLC in Joplin produces composite parts for wind turbine nacelles and blades; and ABB in Jefferson City manufactures transformers. Additional demand for wind turbines can therefore boost the employment and economic impact of existing Missouri firms, and possibly even lead to the addition of new manufacturing firms in the state. The employment impacts in Missouri during the construction phase are estimated to range from approximately 1,311 to 3,933 jobs, while earnings are estimated to amount to $79.8 million to $239.5 million under the 30% and 90% scenarios. The employment impacts include manufacturing jobs at companies in the wind turbine supply chain and other job types from the induced impacts in associated industries.

Q. In what year's dollars are the economic impacts calculated in the study stated?

A. All of the economic impact dollar values are stated in terms of 2013 dollars.

III. DESCRIPTION OF STUDY METHODOLOGY

Q. Please describe how the economic impact study was conducted.

A. The impacts of construction and operation of the transmission line were estimated using the IMPLAN model. The specific impacts that were analyzed include direct, indirect, and induced effects on employment, labor income, and output, as well as fiscal impacts—personal and corporate tax revenues—for the four-state region of Kansas, Missouri, Illinois and Indiana. In addition, as stated previously, 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 each state in the four-state region.

Q. What is the IMPLAN model and how does it work?

A. 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 regions, such as counties, as well as databases for multi-region analysis. Stated briefly, the model is used to estimate the total impacts of an increase in spending in a particular industry. The economic impacts of the manufacturing of the required components, construction of the Project, and its operation and maintenance expenses were estimated using the IMPLAN model and 2011 data for Kansas, Missouri, Illinois and Indiana.

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 production of new structures that will be used to support the Project. 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 induced effects is the increased spending of the incomes earned by newly hired steel workers.

The analysis summarized here focuses on the impacts of increased production of the different components of the Project, as well as the 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 equivalents. 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), which is a measure of the value of output produced. Impacts are estimated on a statewide basis for the four-state region, as well as for the United States as a whole.

Q. What is the JEDI model and how does it work?

A. The economic analysis of wind power development in the study utilized the JEDI Wind Energy Model (release number W1.10.03) of the U.S. Department of Energy's NREL. 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 calculates how purchases of materials for construction of new wind generation facilities benefit not only local turbine and turbine component manufacturers, but also the local industries that supply the concrete, rebar, and other materials needed to construct the facilities. Although the wind farms will be built in Kansas, Missouri is well-positioned to capture some of the manufacturing of wind turbine components with Missouri-based manufacturing companies such as Schaeffer Group, Able Manufacturing and ABB. 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 other economic activities that result from these activities. Economic activities would include contracts and business transactions that result in jobs being created and income being earned. The results are broken down into the construction period and the operation period of the wind generators. 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 a change in the direct final demand (i.e., spending on construction labor and services) 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, as well as other purchases of goods and offsite services. For example, concrete that is used in turbine foundations increases the demand for gravel, sand, and cement. Construction of the wind farm also increases demand for products of the manufacturers of turbine parts and components such as bearing producers, steel producers, and gear producers.

Indirect impacts during the operating years refer to the changes in inter-industry purchases resulting from the direct final demand changes. All land lease payments and property taxes are included in the operating-years portion of the results because these payments do not support the day-to-day O&M 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 the operating years of the wind generation facilities 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.

Q. Where did you obtain your data inputs?

A. The estimates of the construction costs and the O&M costs of the Grain Belt Express Project and the breakdown of those costs by category were supplied by Grain Belt Express. Similarly, the estimates of the number of the wind farms that are projected to be constructed in Kansas as a result of the Grain Belt Express Project and the associated numbers of wind turbines and their capacities were supplied by Grain Belt Express. I reviewed the estimates that were provided and found that they were reasonable and in line with industry norms based on my experience with the wind turbine and electric transmission industries. The portions of the component equipment, parts and materials for the Project and the new wind generation facilities that are projected to be manufactured or produced in the United States were based on the JEDI model, industry reports and my knowledge of the wind industry.

Because it is difficult to know which companies will build components for the proposed wind farms until they are actually built, we estimated the economic impacts using two different scenarios. Given the overall domestic content from the national model, we assumed that the four-state region obtains either 30% or 90% of the total domestic content. In the case of structures, Missouri does not currently have any wind turbine tower manufacturers. Therefore, we shifted the Missouri wind turbine structure component supply to the other states.

Q. Please summarize the main conclusions of your testimony.

A. Based on the IMPLAN model, my analysis shows that the Project itself will result in 1,315 Missouri jobs per year during three-year construction of the Project and 70 long-term Missouri jobs during ongoing operations. In addition, the Project will enable 4,000 MW of wind farms to be built that will result in an additional 1,311 to 3,933 Missouri jobs in manufacturing and associated industries based on the JEDI model.

Q. Does this conclude your prepared direct testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Grain Belt Express) Clean Line LLC for a Certificate of Convenience and) Necessity Authorizing it to Construct, Own, Control,) Manage, Operate and Maintain a High Voltage, Direct) Current Transmission Line and an Associated Converter) Station Providing an Interconnection on the Maywood) 345 kV Transmission Line)	Case No. EA-2014-0207

AFFIDAVIT OF DAVID G. LOOMIS

STATE OF ILLINOIS______)
) ss
COUNTY OF MCLEAN_____)

David G. Loomis, being first duly sworn on his oath, states:

1. My name is David G. Loomis. I am Principal of Strategic Economic Research, LLC, a Professor of Economics at Illinois State University, Director of the Center for Renewable Energy, and Executive Director of the Institute for Regulatory Policy Studies.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Grain Belt Express Clean Line, LLC consisting of 11 pages, having been prepared in written form for introduction into evidence in the above-captioned docket.

3. I have knowledge of the matters set forth therein. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded, including any attachments thereto, are true and accurate to the best of my knowledge, information and belief.

[signature]
David G. Loomis

Subscribed and sworn before me this 20th day of March, 2014.

[signature: Connie J. Carstens]
Notary Public

My commission expires: 04-09-2017

"OFFICIAL SEAL"
CONNIE J. CARSTENS
Notary Public, State of Illinois
My Commission Expires 04-09-2017

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David G. Loomis
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Education

Doctor of Philosophy, Economics, Temple University, Philadelphia, Pennsylvania, May 1995.

Bachelor of Arts, Mathematics and Honors Economics, Temple University, Magna Cum Laude, May 1985.

Experience

1996-present Illinois State University, Normal, IL
Full Professor – Department of Economics (2010-present)
Associate Professor - Department of Economics (2002-2009)
Assistant Professor - Department of Economics (1996-2002)

- Taught Regulatory Economics, Telecommunications Economics and Public Policy, Industrial Organization and Pricing, Individual and Social Choice, Economics of Energy and Public Policy and a Graduate Seminar Course in Electricity, Natural Gas and Telecommunications Issues.
- Supervised as many as 5 graduate students in research projects each semester.
- Served on numerous departmental committees.

1997-present Institute for Regulatory Policy Studies, Normal, IL
Executive Director (2005-present)
Co-Director (1997-2005)

- Grew contributing membership from 5 companies to 16 organizations.
- Doubled the number of workshop/training events annually.
- Supervised 2 Directors, Administrative Staff and internship program.
- Developed and implemented state-level workshops concerning regulatory issues related to the electric, natural gas, and telecommunications industries.

2006-present Illinois Wind Working Group, Normal, IL
Director

- Founded the organization and grew the organizing committee to over 200 key wind stakeholders
- Organized annual wind energy conference with over 400 attendees
- Organized strategic conferences to address critical wind energy issues
- Initiated monthly conference calls to stakeholders
- Devised organizational structure and bylaws

Experience (cont'd)

2007-present Center for Renewable Energy, Normal, IL
Director

- Created founding document approved by the Illinois State University Board of Trustees and Illinois Board of Higher Education.
- Secured over $150,000 in funding from private companies.
- Hired and supervised 4 professional staff members and supervised 3 faculty members as Associate Directors.
- Reviewed renewable energy manufacturing grant applications for Illinois Department of Commerce and Economic Opportunity for a $30 million program.
- Created technical "Due Diligence" documents for the Illinois Finance Authority loan program for wind farm projects in Illinois.

1997-2002 International Communications Forecasting Conference
Chair

- Expanded Planning Committee with representatives from over 18 different international companies and delivered high quality conference attracting over 500 people over 4 years.

1985-1996 Bell Atlantic, Philadelphia, Pa.
Economist - Business Research

- Wrote and taught Applied Business Forecasting multimedia course.
- Developed and documented 25 econometric demand models that were used in regulatory filings.
- Provided statistical and analytic support to regulatory costing studies.
- Served as subject matter expert in switched and special access.
- Administered $4 million budget including $1.8 million consulting budget.

External Affiliations

Great Lakes Wind Collaborative – Steering Committee and Co-Chair, Transmission and Economic Development Workgroup

State Energy Sector Partnership – Board Member

Center for Emerging Entrepreneurs – Vice Chairman, Board of Advisors

Midwest Solar Training Network Solar Advisory Group

Professional Awards and Memberships

2011 Midwestern Regional Wind Advocacy Award from the Department of Energy's Wind Powering America presented at WindPower 2011

2009 Economics Department Scott M. Elliott Faculty Excellence Award – awarded to faculty who demonstrate excellence in teaching, research and service.

2009 Illinois State University Million Dollar Club – awarded to faculty who have over $1 million in grants through the university.

2008 Outstanding State Wind Working Group Award from the Department of Energy's Wind Power America presented at WindPower 2008.

1999 Illinois State University Teaching Initiative Award

Member of the American Economic Association, National Association of Business Economists, International Association for Energy Economics, Institute for Business Forecasters; Institute for International Forecasters, International Telecommunications Society.

Professional Publications

28. **Loomis, D. G.** and Bowden, N. S. (2013). Nationwide Database of Electric Rates to Become Available, *Natural Gas & Electricity*, 30 (5), 20-25.

27. Jin, J. H., **Loomis, D.G.,** and Aldeman, M. R. (2013). Optimum penetration of utility-scale grid-connected solar photovoltaic systems in Illinois, *Renewable Energy*, 60, 20-26.

26. Malm, E., **Loomis, D.,** DeFranco, J. (2012). A Campus Technology Choice Model with Incorporated Network Effects: Choosing Between General Use and Campus Systems, *International Journal of Computer Trends and Technology,* 3(4), 622-629.

25. Chupp, B. A., Hickey, E.A. & **Loomis, D. G.** (2012). Optimal Wind Portfolios in Illinois, *Electricity Journal*, 25, 46-56.

24. Hickey, E., **Loomis, D. G.,** & Mohammadi, H. (2012). Forecasting hourly electricity prices using ARMAX-GARCH models: An application to MISO hubs, *Energy Economics,* 34, 307-315.

23. Theron, S., Winter, J.R, **Loomis, D. G.,** & Spaulding, A. D. (2011). Attitudes Concerning Wind Energy in Central Illinois. *Journal of the America Society of Farm Managers and Rural Appraisers*, 74, 120-128.

Professional Publications (cont'd)

22. Payne, J. E., **Loomis, D. G.** & Wilson, R. (2011). Residential Natural Gas Demand in Illinois: Evidence from the ARDL Bounds Testing Approach. *Journal of Regional Analysis and Policy,* 41(2), 138.

21. **Loomis, D. G.** & Ohler, A. O. (2010). Are Renewable Portfolio Standards A Policy Cure-all? A Case Study of Illinois's Experience. *Environmental Law and Policy Review, 35,* 135-182.

20. Gil-Alana, L. A., **Loomis, D. G., &** Payne, J. E. (2010). Does energy consumption by the U.S. electric power sector exhibit long memory behavior ? *Energy Policy,* 38, 7512-7518.

19. Carlson, J. L., Payne, J. E., & **Loomis, D. G**. (2010). An assessment of the Economic Impact of the Wind Turbine Supply Chain in Illinois. *Electricity Journal*, 13, 75-93.

18. Apergis, N., Payne, J. E., & **Loomis, D. G.** (2010). Are shocks to natural gas consumption transitory or permanent? *Energy Policy, 38*, 4734-4736.

17. Apergis, N., Payne, J. E., & **Loomis, D. G.** (2010). Are fluctuations in coal consumption transitory or permanent? Evidence from a panel of U.S. states. *Applied Energy, 87,* 2424-2426.

16. Hickey, E. A., Carlson, J. L., & **Loomis, D. G.** (2010). Issues in the determination of the optimal portfolio of electricity supply options. *Energy Policy*, *38*, 2198-2207.

15. Carlson, J. L., & **Loomis, D. G.** (2008). An assessment of the impact of deregulation on the relative price of electricity in Illinois. *Electricity Journal, 21*, 60-70.

14. Loomis, D. G., (2008). The telecommunications industry. In H. Bidgoli (Ed.), *The handbook of computer networks* (pp. 3-19). Hoboken, NJ: John Wiley & Sons.

13. Cox, J. E., Jr., & **Loomis, D. G.** (2007). A managerial approach to using error measures in the evaluation of forecasting methods. *International Journal of Business Research, 7,* 143-149.

12. Cox, J. E., Jr., & **Loomis, D. G.** (2006). Improving forecasting through textbooks – a 25 year review. *International Journal of Forecasting, 22,* 617-624.

11. Swann, C. M., & **Loomis, D. G**. (2005). Competition in local telecommunications – there's more than you think. *Business Economics, 40,* 18-28.

Professional Publications (cont'd)

10. Swann, C. M., & **Loomis, D. G.** (2005). Intermodal competition in local telecommunications markets. *Information Economics and Policy, 17, 97-113.*

9. Swann, C. M., & **Loomis, D. G.** (2004) Telecommunications demand forecasting with intermodal competition – a multi-equation modeling approach. *Telektronikk, 100,* 180-184.

8. Cox, J. E., Jr., & **Loomis, D. G.** (2003). Principles for teaching economic forecasting. *International Review of Economics Education,* 1, 69-79.

7. Taylor, L. D. & **Loomis, D. G.** (2002). *Forecasting the internet: understanding the explosive growth of data communications.* Boston: Kluwer Academic Publishers.

6. Wiedman, J. & **Loomis, D. G.** (2002). U.S. broadband pricing and alternatives for internet service providers. In D. G. Loomis & L. D. Taylor (Eds.) Boston: Kluwer Academic Publishers.

5. Cox, J. E., Jr. & **Loomis, D. G.** (2001). Diffusion of forecasting principles: an assessment of books relevant to forecasting. In J. S. Armstrong (Ed.), *Principles of Forecasting: A Handbook for Researchers and Practitioners* (pp. 633-650). Norwell, MA: Kluwer Academic Publishers.

4. Cox, J. E., Jr. & **Loomis, D. G.** (2000). A course in economic forecasting: rationale and content. *Journal of Economics Education*, 31, 349-357.

3. Malm, E. & **Loomis, D. G.** (1999). Active market share: measuring competitiveness in retail energy markets. *Utilities Policy, 8, 213-221.*

2. Loomis, D. G. (1999). Forecasting of new products and the impact of competition. In D. G. Loomis & L. D. Taylor (Eds.), *The future of the telecommunications industry: forecasting and demand analysis.* Boston: Kluwer Academic Publishers.

1. Loomis, D. G. (1997). Strategic substitutes and strategic complements with interdependent demands. *The Review of Industrial Organization,* 12, 781-791.

Presentations

"National Utility Rate Database," presented October 23, 2013 at Solar Power International, Chicago, IL.

"Potential Economic Impact of Offshore Wind Energy in the Great Lakes," presented September 23, 2013 at Great Lakes Wind Collaborative Annual Meeting, Columbus, OH.

Presentations (cont'd)

"Potential Economic Impact of Offshore Wind Energy in the Great Lakes," presented May 6, 2013 at WindPower 2013, Chicago, IL.

"Why Illinois? Windy City, Prairie Power," presented May 5, 2013 at WindPower 2013, Chicago, IL.

"Siting Illinois Wind Energy," testified April 23, 2013 before the Boone County Board, Belvidere, IL.

"Illinois Wind Energy," Emerging Illinois Electric Topics Conference, Electrical Board of Missouri and Illinois, March 12& 19, 2013 in Collinsville, Il and Bloomington, IL.

"National Utility Rate Database," presented January 29, 2013 at the EUEC Conference, Phoenix, AZ.

"Energy Learning Exchange and Green Jobs," presented December 13, 2012 at the TRICON Meeting of Peoria and Tazewell County Counselors, Peoria, IL.

"Paradigm Bio-Aviation and the Center for Renewable Energy," presented December 10, 2012 at the Bloomington City Council Meeting, Bloomington, IL.

"Potential Economic Impact of Offshore Wind Energy in the Great Lakes," presented November 12, 2012 at the Offshore Wind Jobs and Economic Development Impacts Webinar.

"Energy Learning Exchange," presented October 31, 2012 at the Utility Workforce Development Meeting, Chicago, IL.

"Potential Economic Impact of Offshore Wind Energy in the Great Lakes," presented September 26, 2012 at the Great Lakes Wind Collaborative' s Fifth Annual Meeting, Erie, PA.

"Energy-Related Research at ISU," presented July 18, 2012 at the Sixth Annual Advancing Wind Power in Illinois Conference, Normal, IL.

"Illinois Wind Energy," presented July 17, 2012 at the Sixth Annual Advancing Wind Power in Illinois Conference, Normal, IL.

"Wind Energy in McLean County," presented June 26, 2012 at BN By the Numbers, Normal, IL.

"Wind Energy," presented June 14, 2012 at the Wind for Schools Statewide Teacher Workshop, Normal, IL.

"National Utility Rate Database," presented June13, 2012 at the Department of Energy SunShot Conference, Denver, CO.

Presentations (cont'd)

"Economic Impact of Wind Energy in Illinois," presented June 6, 2012 at AWEA's WINDPOWER 2012, Atlanta, GA.

"National Utility Rate Database," presented April 26, 2012 at the IRPS Conference, Springfield, IL.

"Wind Farms in Your Community," presented April 19, 2012 to the University of Illinois Extension Teleconference: Siting and Permitting Wind Farms in Illinois.

"Wind Farms in Your Community," presented April 12, 2012 to the Whiteside County Board and Whiteside County Planning and Zoning Committee, Whiteside County, IL.

"Wind Energy 101," presented March 29, 2012 to the Presidential Scholars, Illinois State University, Normal, IL.

"Trends in Illinois Wind Energy," presented March 6, 2012 at the AWEA Regional Wind Energy Summit – Midwest in Chicago, IL.

"Trends in Illinois Wind Energy," presented February 8, 2012 at the Illinois Wind Working Group Siting, Taxing and Zoning of Wind Farms, Normal, IL.

"Center for Renewable Energy Overview," presented December 2, 2011 at the Midwest Energy Policy Conference in St. Louis, MO.

"Challenges and New Growth Strategies in the Wind Energy Business," invited plenary session speaker at the Green Revolution Leaders Forum, November 18, 2011 in Seoul, South Korea.

"Economic Impact of Wind Farms," presented August 26, 2011 at the Illinois Department of Commerce and Economic Opportunity Peer Exchange, Peru, IL.

"Current Research by the Center for Renewable Energy," presented July 22, 2011 at the Fifth Annual Advancing Wind Power in Illinois Conference in Chicago, IL.

"Overview of the Center for Renewable Energy," presented July 20, 2011 at the University-Industry Consortium Meeting at Illinois Institute of Technology, Chicago, IL.

"Building the Wind Turbine Supply Chain," presented May 11, 2011 at the Supply Chain Growth Conference, Chicago, IL

"Building a Regional Energy Policy for Economic Development," presented April 4, 2011 at the Midwestern Legislative Conference's Economic Development Committee Webinar.

Presentations (cont'd)

"Wind Energy 101," presented February 7, 2011 at the Wind Power in Central Illinois - A Public Forum, CCNET Renewable Energy Group, Champaign, IL.

"Overview of County Wind Farm Activity," presented February 9, 2011 at the Illinois Wind Working Group Siting, Taxing and Zoning of Wind Farms, Normal, IL.

"Wind Energy 101," presented February 9, 2011 at the Illinois Wind Working Group Siting, Taxing and Zoning of Wind Farms, Normal, IL.

"Alternative Energy Strategies," presented with Matt Aldeman November 19, 2010 at the Innovation Talent STEM Education Forum, Chicago, IL.

"Siting and Zoning in Illinois," presented November 17, 2010 at the Wind Powering America Webinar.

"What Governor Quinn Should Do about Energy?" presented November 15, 2010 at the Illinois Chamber of Commerce Energy Forum Conference, Chicago, IL.

Oral Testimony before the Illinois Senate Energy and Environment Committee, Senator Jacobs presiding, October, 28, 2010, Chicago, IL.

"Is Wind Energy Development Right for Illinois," presented with Matt Aldeman October 28, 2010 at the Illinois Association of Illinois County Zoning Officials Annual Seminar in Utica, IL.

"Solar Market Transformation," presented October 29, 2010 at the Solar Market Transformation Conference in Normal, IL.

"Economic Impacts; Public Beliefs and Opinions," presented with Matt Aldeman October 28, 2010 at the Illinois Association of Illinois County Zoning Officials Annual Seminar in Utica, IL.

"Wind Energy Development in Illinois," presented with Matt Aldeman October 28, 2010 at the Illinois Association of Illinois County Zoning Officials Annual Seminar in Utica, IL.

"Latest Trends in Wind Energy," presented September 30, 2010 at the Soil and Water Conservation District Wind Farm Workshop in Normal, IL.

"Understanding the Economic Impact of Wind Energy in Illinois," presented September 20, 2010 at the Third Annual Meeting of the Great Lakes Wind Collaborative in Cleveland, OH.

"Economic Impact of Wind Energy in Illinois," presented July 28, 2010 at the Livingston County Zoning Board of Appeals Hearing in Pontiac, IL.

Presentations (cont'd)

"Renewable Energy," presented July 26, 2010 at the Children's Discovery Museum in Normal, IL.

"Economic Impact of Wind Energy in Illinois," presented July 22, 2010 at the AgriEnergy Conference in Champaign, IL.

"Renewable Energy Major at ISU," presented July 21, 2010 at Green Universities and Colleges Subcommittee Webinar.

"Center for Renewable Energy Research," presented July 15, 2010 at the Advancing Wind Power in Illinois Conference in Peoria, IL.

"Economic Impact of Wind Energy in Illinois," presented June 22, 2010 at the GLWC Presents: JEDI Analysis in the Great Lakes Webinar.

"From Wind Farms to Residential Wind and Solar: What's Happening in Illinois?," presented June 10, 2010 at the Eastern Illini Electric Cooperative Annual Meeting in Paxton, IL.

"Economics of Wind Energy," presented May 19, 2010 at the U.S. Green Building Council meeting in Chicago, IL.

"Economic Costs and Benefits of Wind Energy," presented May 7, 2010 at the Rockford Area Realtors Association meeting in Rockford, IL

"Forecasting: A Primer for the Small Business Entrepreneur," presented with James E. Cox, Jr. April 14, 2010 at the Allied Academies' Spring International Conference in New Orleans, LA.

"Wind Energy 101," presented March 10, 2010 at Peoria Christian School in Peoria, IL and March 30, 2010 at the Illinois State University Presidential Scholars Symposium in Normal, IL.

"Are Renewable Portfolio Standards a Policy Cure-All? A Case Study of Illinois' Experience," presented January 30, 2010 at the 2010 William and Mary Environmental Law and Policy Review Symposium in Williamsburg, VA.

"Creating Partnerships between Universities and Industry," presented November 19, 2009, at New Ideas in Educating a Workforce in Renewable Energy and Energy Efficiency in Albany, NY.

"Educating Illinois in Renewable Energy, presented November 14, 2009 at the Illinois Science Teachers Association in Peoria, IL.

"Green Collar Jobs," invited presentation October 14, 2009 at the 2009 Workforce Forum in Peoria, IL.

Presentations (cont'd)

"Economic Impact of Wind Energy in Illinois," presented August 11, 2009 at the AgriEnergy Conference in Champaign, IL.

"Economic Impact of Wind Energy in Illinois," presented July 16, 2009 at the Advancing Wind Power in Illinois Conference in Bloomington, IL.

"Illinois Wind Working Group," presented July 15, 2009 at the Advancing Wind Power in Illinois Conference in Bloomington, IL.

"Wind Energy," presented June 11, 2009 at State Farm Insurance Lunch 'n Learn in Bloomington, IL.

"Illinois Wind and Economic Development," with Wayne Hartel, presented June 4, 2009 at the Great Lakes Wind Collaborative Economic Development Group Webinar.

"The Economic Benefits of Wind Farms," presented May, 21, 2009 at the Central Illinois Economic Development Council Meeting in Normal, IL.

"The Role of Wind Power in Illinois," presented March 4, 2009 at the Association of Illinois Electric Cooperatives Engineering Seminar in Springfield, IL.

"The Economic Benefits of Wind Farms," presented January 30, 2009 at the East Central Illinois Economic Development District Meeting in Champaign, IL.

"Wind Energy 101," presented January 7, 2009 at the Northern Illinois Farm Show in DeKalb, Illinois.

"Green Collar Jobs in Illinois," presented January 6, 2009 at the Illinois Workforce Investment Board Meeting in Macomb, Illinois.

"Wind Energy 101," presented December 16, 2008 at the Landowner's Forum in Monmouth, Illinois; January 23, 2009 in Manito, IL; February 13, 2009 in Champaign, IL and Pontiac, IL; March 16, 2009 in Monmouth, IL; June 15, 2009 in Jacksonville, IL; October 7. 2009 in Chicago, IL; October 7, in Lemont, IL; November 9, 2009 in Ottawa, IL; December 9, 2009 in Pontiac, IL.

"Wind Energy 101," presented September 4, 2008 at the Chillicothe Rotary, Chillicothe, Illinois.

"Green Collar Jobs: What Lies Ahead for Illinois?" presented August 1, 2008 at the Illinois Employment and Training Association Conference.

"Wind Energy: What Lies Ahead for Illinois?" presented June 26, 2008 at the Advancing Wind Power in Illinois 2008 Conference.

Presentations (cont'd)

"Mapping Broadband Access in Illinois," presented October 16, 2007 at the Rural Telecon '07 conference.

"A Managerial Approach to Using Error Measures to Evaluate Forecasting Methods," presented October 15, 2007 at the International Academy of Business and Economics.

"Wind Energy: Is It Right For Illinois?" presented October 10, 2007 to DeKalb County Farm Bureau.

"Dollars and Sense: The Pros and Cons of Renewable Fuel," presented October 18, 2006 at Illinois State University Faculty Lecture Series.

"Broadband Access in Illinois," presented July 28, 2006 at the Illinois Association of Regional Councils Annual Meeting.

"Broadband Access in Illinois," presented November 17, 2005 at the University of Illinois' Connecting the e to Rural Illinois.

"Electricity, Natural Gas and Telecommunications," presented November 7, 2005 at Illinois Wesleyan University.

"Improving Forecasting Through Textbooks – A 25 Year Review," with James E. Cox, Jr., presented June 14, 2005 at the 25^{th} International Symposium on Forecasting.

"Telecommunications Demand Forecasting with Intermodal Competition, with Christopher Swann, presented April 2, 2004 at the Telecommunications Systems Management Conference 2004.

Wind Energy at Illinois State University" presented March 4, 2004 at University of Illinois' Urban Planning Institute.

"Intermodal Competition," with Christopher Swann, presented April 3, 2003 at the Telecommunications Systems Management Conference 2003.

"Lectora Versus Presenter: Student and Instructor Reactions," presented March 26, 2003 at the Illinois State University Conference on Teaching with Technology.

"Intermodal Competition in Local Exchange Markets," with Christopher Swann, presented June 26, 2002 at the 20^{th} Annual International Communications Forecasting Conference.

"Assessing Retail Competition," presented May 23, 2002 at the Institute for Regulatory Policy Studies' Illinois Energy Policy for the 21^{st} Century workshop.

Presentations (cont'd)

"Tips, Tricks and Techniques for Telecom Forecasters," presented June 28, 2001 at the 19th Annual International Communications Forecasting Conference.

"The Devil in the Details: An Analysis of Default Service and Switching," with Eric Malm presented May 24, 2001 at the 20th Annual Advanced Workshop on Regulation and Competition.

"Resources for Forecasters," presented September 28, 2000 at the 18th Annual International Communications Forecasting Conference, Seattle, WA.

"Forecasting Challenges for U.S. Telecommunications with Local Competition," presented June 28, 1999 at the 19th International Symposium on Forecasting.

"Acceptance of Forecasting Principles in Forecasting Textbooks," presented June 28, 1999 at the 19th International Symposium on Forecasting.

"Forecasting Challenges for Telecommunications With Local Competition," presented June 17, 1999 at the 17th Annual International Communications Forecasting Conference.

"Measures of Market Competitiveness in Deregulating Industries," with Eric Malm, presented May 28, 1999 at the 18th Annual Advanced Workshop on Regulation and Competition.

"Trends in Telecommunications Forecasting and the Impact of Deregulation," Proceedings of EPRI's 11th Forecasting Symposium, 1998.

"Forecasting in a Competitive Age: Utilizing Macroeconomic Forecasts to Accurately Predict the Demand for Services," invited speaker, Institute for International Research Conference, September 29, 1997.

"Who Can you Trust? Using the Best Macroeconomic Forecasts," and "What's on the Internet in Telecommunications and Forecasting?" presented June 26, 1997 at the 1997 International Communications Forecasting Conference.

"Regulatory Fairness and Local Competition Pricing," presented May 30, 1996 at the 15th Annual Advanced Workshop in Regulation and Public Utility Economics.

"Optimal Pricing For Special Access Demand," presented July 8, 1993 at the 1993 National Telecommunications Forecasting Conference.

"Optimal Pricing For a Regulated Monopolist Facing New Competition: The Case of Bell Atlantic Special Access Demand," presented May 28, 1992 at the Rutgers Advanced Workshop in Regulation and Public Utility Economics.

"The FCC Price Cap Proposal: A Fairness Analysis," presented October 26, 1989 at the 1989 Business Research Conference.

"The Fairness of Price Cap Regulation," presented April 14, 1989 at the Rutgers Advanced Workshop in Regulation and Public Utility Economics.

Grants

"SmartGrid for Schools," with William Hunter, Illinois Science and Energy Innovation Foundation, January 2014, $451,701.

"Lake Michigan Offshore Wind Energy Buoy,"with Matt Aldeman, Illinois Clean Energy Community Foundation, Request ID 6435, November, 2013, $90,000.

"Teaching Next Generation Energy Concepts with Next Generation Science Standards," with William Hunter, Matt Aldeman and Amy Bloom, Illinois State Board of Education, RSP # 13B170A, October, 2013, second year, $159,954.

"Solar for Schools," with Matt Aldeman, Illinois Green Economy Network, RSP # 13C280, August, 2013, $66,072.

"Energy Learning Exchange Implementation Grant," with William Hunter and Matt Aldeman, Illinois Department of Commerce and Economic Opportunity, Award Number 13-052003, June, 2013, $350,000.

"Teaching Next Generation Energy Concepts with Next Generation Science Standards," with William Hunter, Matt Aldeman and Amy Bloom, Illinois State Board of Education, RSP # 13B170, April, 2013, $159,901.

"Illinois Sustainability Education SEP," Illinois Department of Commerce and Economic Opportunity, Award Number 08-431006, March, 2013, $225,000.

"Illinois Pathways Energy Learning Exchange Planning Grant," with William Hunter and Matt Aldeman, Illinois State Board of Education (Source: U.S. Department of Education), RSP # 13A007, December, 2012, $50,000.

"Illinois Sustainability Education SEP," Illinois Department of Commerce and Economic Opportunity, Award Number 08-431005, June 2011, amended March, 2012, $98,911.

"Wind for Schools Education and Outreach," with Matt Aldeman, Illinois Department of Commerce and Economic Opportunity, Award Number 11-025001, amended February, 2012, $111,752.

"A Proposal to Support Solar Energy Potential and Job Creation for the State of Illinois Focused on Large Scale Photovoltaic System," with Jin Jo (lead PI), Illinois Department of Commerce and Economic Opportunity, Award Number 12-025001, January 2012, $135,000.

"National Database of Utility Rates and Rate Structure," U.S. Department of Energy, Award Number DE-EE0005350TDD, 2011-2014, $850,000.

Grants (cont'd)

"Illinois Sustainability Education SEP," Illinois Department of Commerce and Economic Opportunity, Award Number 08-431005, June 2011, $75,000.

"Wind for Schools Education and Outreach," with Matt Aldeman, Illinois Department of Commerce and Economic Opportunity, Award Number 11-025001, March 2011, $190,818.

"Using Informal Science Education to Increase Public Knowledge of Wind Energy in Illinois," with Amy Bloom and Matt Aldeman, Scott Elliott Cross-Disciplinary Grant Program, February 2011, $13,713.

"Wind Turbine Market Research," with Matt Aldeman, Illinois Manufacturers Extension Center, May, 2010, $4,000.

"Petco Resource Assessment," with Matt Aldeman, Petco Petroleum Co., April, 2010 amended August 2010 $34,000; original amount $18,000.

"Wind for Schools Education and Outreach," with Anthony Lornbach and Matt Aldeman, Scott Elliott Cross-Disciplinary Grant Program, February, 2010, $13,635.

"IGA IFA/ISU Wind Due Diligence," Illinois Finance Authority, November, 2009, $8,580 amended December 2009; original amount $2,860.

"Green Industry Business Development Program, with the Shaw Group and Illinois Manufacturers Extension Center, Illinois Department of Commerce and Economic Opportunity, Award Number 09-021007, August 2009, $245,000.

"Wind Turbine Workshop Support," Illinois Department of Commerce and Economic Opportunity, June 2009, $14,900.

"Illinois Wind Workers Group," with Randy Winter, U.S. Department of Energy, Award Number DE-EE0000507, 2009-2011, $107,941.

"Wind Turbine Supply Chain Study," with J. Lon Carlson and James E. Payne, Illinois Department of Commerce and Economic Opportunity, Award Number 09-021003, April 2009, $125,000.

"Renewable Energy Team Travel to American Wind Energy Association WindPower 2009 Conference, Center for Mathematics, Science and Technology, February 2009, $3,005.

"Renewable Energy Educational Lab Equipment," with Randy Winter and David Kennell, Illinois Clean Energy Community Foundation (peer-reviewed), February, 2008, $232,600.

Grants (cont'd)

"Proposal for New Certificate Program in Electricity, Natural Gas and Telecommunications Economics," with James E. Payne, Extended Learning Program Grant, April, 2007, $29,600.

"Illinois Broadband Mapping Study," with J. Lon Carlson and Rajeev Goel, Illinois Department of Commerce and Economic Opportunity, Award Number 06-205008, 2006-2007, $75,000.

"Illinois Wind Energy Education and Outreach Project," with David Kennell and Randy Winter, U.S. Department of Energy, Award Number DE-FG36-06GO86091, 2006-2010, $990,000.

"Wind Turbine Installation at Illinois State University Farm," with Doug Kingman and David Kennell, Illinois Clean Energy Community Foundation (peer-reviewed), May, 2004, $500,000.

"Illinois State University Wind Measurement Project," Doug Kingman and David Kennell, Illinois Clean Energy Community Foundation (peer-reviewed), with August, 2003, $40,000.

"Illinois State University Wind Measurement Project," with Doug Kingman and David Kennell, NEG Micon matching contribution, August, 2003, $65,000.

"Distance Learning Technology Program," Illinois State University Faculty Technology Support Services, Summer 2002, $3,000.

"Providing an Understanding of Telecommunications Technology By Incorporating Multimedia into Economics 235," Instructional Technology Development Grant (peer-reviewed), January 15, 2001, $1,400.

"Using Real Presenter to create a virtual tour of GTE's Central Office," with Jack Chizmar, Instructional Technology Literacy Mentoring Project Grant (peer-reviewed), January 15, 2001, $1,000.

"An Empirical Study of Telecommunications Industry Forecasting Practices," with James E. Cox, College of Business University Research Grant (peer-reviewed), Summer, 1999, $6,000.

"Ownership Form and the Efficiency of Electric Utilities: A Meta-Analytic Review" with L. Dean Hiebert, *Institute for Regulatory Policy Studies* research grant (peer-reviewed), August 1998, $6,000.

Total Grants: $5,536,583

External Funding

Corporate Funding for *Institute for Regulatory Policy Studies*, Ameren ($7,500), Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midwest Energy Efficiency Alliance ($4,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2014, $112,000 total.

Corporate Funding for Energy Learning Exchange, Calendar Year 2013, $53,000.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2013, $17,097.

Corporate Funding for *Institute for Regulatory Policy Studies*, Ameren ($7,500), Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2013, $97,500 total.

Corporate Funding for Illinois Wind Working Group, Calendar Year 2012, $29,325.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2012, $16,060.

Corporate Funding for *Institute for Regulatory Policy Studies*, Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2012, $90,000 total.

Corporate Funding for Illinois Wind Working Group, Calendar Year 2011, $57,005.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2011, $13,562.

Corporate Funding for *Institute for Regulatory Policy Studies*, Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2011, $90,000 total.

External Funding (cont'd)

Corporate Funding for *Center for Renewable Energy,* Calendar Year 2010, $50,000.

Corporate Funding for *Illinois Wind Working Group*, Calendar Year 2010, $49,000.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with Lon Carlson, Fiscal Year 2010, $17,759.

Corporate Funding for *Institute for Regulatory Policy Studies*, Alliance Pipeline ($7,500); Ameren ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); ITC Holdings ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2010, $82,500 total.

Corporate Funding for *Illinois Wind Working Group*, Calendar Year 2009, $57,140.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with Lon Carlson, Fiscal Year 2009, $21,988.

Corporate Funding for *Institute for Regulatory Policy Studies*, Alliance Pipeline ($7,500); Ameren ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); MidAmerican Energy ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2009, $82,500 total.

Corporate Funding for *Center for Renewable Energy,* Calendar Year 2008, $157,500.

Corporate Funding for *Illinois Wind Working Group*, Calendar Year 2008, $38,500.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with Lon Carlson, Fiscal Year 2008, $28,489.

Corporate Funding for *Institute for Regulatory Policy Studies*, Alliance Pipeline ($5,000); Ameren ($5,000); AT&T ($5,000);Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); MidWest ISO ($5,000); NICOR Energy ($5,000); Peabody Energy ($5,000), People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); Fiscal Year 2008, $60,000 total.

Corporate Funding for *Illinois Wind Working Group*, Calendar Year 2007, $16,250.

External Funding (cont'd)

Workshop Surplus for *Institute for Regulatory Policy Studies*, with Lon Carlson, Fiscal Year 2007, $19,403.

Corporate Funding for *Institute for Regulatory Policy Studies*, AARP ($3,000), Alliance Pipeline ($5,000), Ameren ($5,000); Citizens Utility Board ($5,000); Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); MidWest ISO ($5,000); NICOR Energy ($5,000); Peabody Energy ($5,000), People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); SBC ($5,000); Verizon ($5,000); Fiscal Year 2007, $73,000 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with Lon Carlson, Fiscal Year 2006, $13,360.

Corporate Funding for *Institute for Regulatory Policy Studies*, AARP ($1,500), Alliance Pipeline ($2,500), Ameren ($5,000); Citizens Utility Board ($5,000); Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); DTE Energy ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); MidWest ISO ($5,000); NICOR Energy ($5,000); Peabody Energy ($2,500), People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); SBC ($5,000); Verizon ($5,000); Fiscal Year 2006, $71,500 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Fiscal Year 2005, $12,916.

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($5,000); Citizens Utility Board ($5,000); Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); MidWest ISO ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); SBC ($2,500); Verizon ($2,500); Fiscal Year 2005, $60,000 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Fiscal Year 2004, $17,515.

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($5,000); Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); Fiscal Year 2004, $45,000 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Fiscal Year 2003, $8,300.

External Funding (cont'd)

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($5,000); AT&T ($2,500); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); Fiscal Year 2003, $32,500 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Calendar Year 2002, $15,700.

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($2,500); AT&T ($5,000); Commonwealth Edison ($2,500); Illinois Power ($2,500); MidAmerican Energy ($2,500); NICOR Energy ($2,500); People Gas Light and Coke ($2,500); Calendar Year 2002, $17,500 total.

Corporate Funding for *International Communications Forecasting Conference*, National Economic Research Associates ($10,000); Taylor Nelson Sofres Telecoms ($10,000); Calendar Year 2002, $20,000 total

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($5,000); AT&T ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 2001, $35,000 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Calendar Year 2001, $19,400.

Corporate Funding for *International Communications Forecasting Conference*, National Economic Research Associates ($10,000); Taylor Nelson Sofres Telecoms ($10,000); SAS Institute ($10,000); Calendar Year 2001, $30,000 total.

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($5,000); AT&T ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 2000, $35,000 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Calendar Year 2000, $20,270.

Corporate Funding for *International Communications Forecasting Conference*, National Economic Research Associates ($10,000); Taylor Nelson Sofres Telecoms ($10,000); Calendar Year 2000, $20,000 total.

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($5,000); AT&T ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 1999, $35,000 total.

External Funding (cont'd)

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Calendar Year 1999, $10,520.

Corporate Funding for *International Communications Forecasting Conference*, National Economic Research Associates ($10,000); PNR Associates ($10,000); Calendar Year 1999, $20,000 total.

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($5,000); CILCO ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 1998, $30,000 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Calendar Year 1998, $44,334.

Corporate Funding for *International Communications Forecasting Conference*, National Economic Research Associates ($10,000); PNR Associates ($10,000); Calendar Year 1998, $20,000 total.

Corporate Funding for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, AmerenCIPS ($5,000); CILCO ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 1997, $30,000 total.

Workshop Surplus for *Institute for Regulatory Policy Studies*, with L. Dean Hiebert, Calendar Year 1997, $19,717.

Total External Funding: $2,021,110

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

June 10, 2013

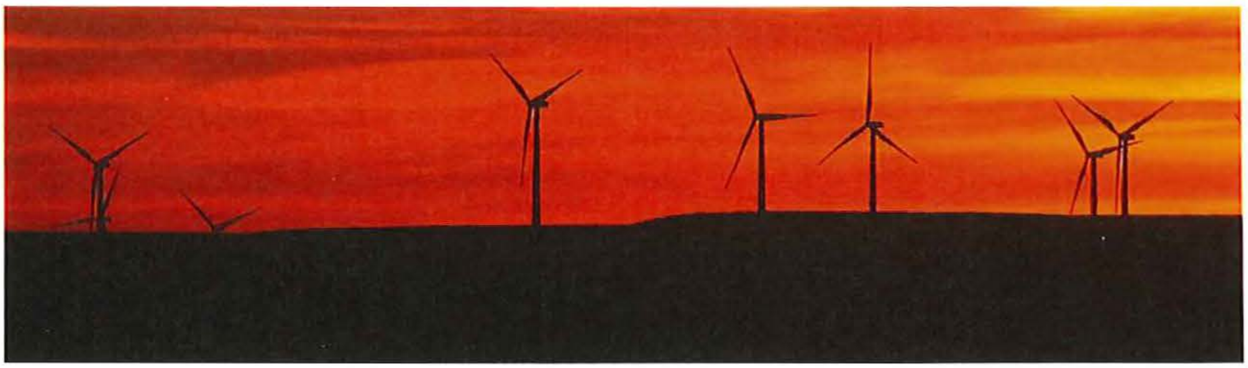

Photo by Jeff Cowell of Wichita, Kansas

Prepared For: Grain Belt Express Clean Line LLC

By

David G. Loomis, Ph.D.

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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 impacts[1] 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 Annual[1] Impacts of Construction of the Grain Belt Express Clean Line in 4-State Region

	Kansas	Missouri	Illinois	Indiana
Change in Final Demand[2]	$220.4	$118.1	$140.1	$3.3
Employment[3]	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
Employment[1]	135	70	88	3
Labor Income[2]	$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 Tax[1]	$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 Average[2]	$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 Tax[1]	$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 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.

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.

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. 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.

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.

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 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.

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.

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 model[4], 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 equivalents[5] (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

			Construction Budget				
Component	IMPLAN Sector	Direct Spending[1]	Kansas	Missouri	Illinois	Indiana	United States
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	*Employment*[2]	1,490	355	657	2,502	834
		Labor Income[3]	$93.0	$23.2	$31.5	$147.7	$49.2
		Output	$192.3	$60.6	$96.4	$349.4	$116.5
Manufacture Structures	$50.7	*Employment*	171	102	106	379	126
		Labor Income	$12.5	$6.2	$5.1	$23.8	$7.9
		Output	$50.7	$16.9	$15.6	$83.2	$27.7
Manufacture Wire	$28.1	*Employment*	46	33	33	112	37
		Labor Income	$3.4	$2.3	$1.6	$7.3	$2.4
		Output	$28.1	$6.9	$4.9	$39.9	$13.3
Architectural Services	$19.8	*Employment*	138	47	82	267	89
		Labor Income	$11.8	$2.6	$3.9	$18.4	$6.1
		Output	$19.8	$6.4	$12.0	$38.2	$12.7
Right of Way	$20.0	*Employment*	126	36	20	182	61
		Labor Income	$1.8	$1.8	$1.0	$4.6	$1.5
		Output	$20.0	$5.6	$3.0	$28.6	$9.5
Financial	$6.5	*Employment*	19	28	13	60	20
		Labor Income	$0.6	$1.5	$0.6	$2.7	$0.9
		Output	$6.5	$5.0	$1.9	$13.4	$4.5
Electric Power	$3.8	*Employment*	4	6	5	15	5
		Labor Income	$0.6	$0.3	$0.2	$1.1	$0.4
		Output	$3.8	$1.0	$0.7	$5.6	$1.9
Installation of Converters/ Transformers	$33.0	*Employment*	256	61	113	429	143
		Labor Income	$16.0	$4.0	$5.4	$25.3	$8.4
		Output	$33.0	$10.4	$16.5	$59.9	$20.0
Totals	$354.2	*Employment*	2,250	667	1,030	3,946	1,315
		Labor Income	$139.7	$41.9	$49.4	$231.0	$77.0
		Output	$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	*Current*	26,081	53,411	78,598	53,875
	Projected Increase	1383	834	758	8
	% Change	5.3%	1.6%	1.0%	0.0%
Manufacture Structures	*Current*	2,256	2,716	6,987	4,734
	Projected Increase	197	126	117	1
	% Change	8.7%	4.7%	1.7%	0.0%
Manufacture Wire	*Current*	575	239	684	304
	Projected Increase	59	37	36	0
	% Change	10.3%	15.7%	5.2%	0.0%
Architectural Services	*Current*	18,462	29,017	61,275	27,611
	Projected Increase	146	89	84	1
	% Change	0.8%	0.3%	0.1%	0.0%
Right of Way	*Current*	50,647	121,734	240,916	109,293
	Projected Increase	104	61	44	1
	% change	0.2%	0.0%	0.0%	0.0%
Financial	*Current*	3,105	8,587	22,989	3,105
	Projected Increase	36	20	17	0
	% Change	1.2%	0.2%	0.1%	0.0%
Electric Power	*Current*	6,040	8,636	18,595	11,203
	Projected Increase	8	5	4	0
	% Change	0.1%	0.1%	0.0%	0.0%
Installation of Converters/ Transformers	*Current*	26,081	53,411	78,598	53,875
	Projected Increase	407	143	390	27
	% Change	1.6%	0.3%	0.5%	0.1%
Totals	*Employment*				
	Labor Income				
	Output	$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	*Employment*[2]	2,657	1,125	1,907	5,689	1,896
		Labor Income[3]	$159.8	$81.5	$106.3	$347.6	$115.9
		Output	$336.6	$273.4	$339.6	$949.5	$316.5
Manufacture Structures	$88.7	*Employment*	299	384	391	1,074	358
		Labor Income	$21.9	$26.9	$21.8	$70.7	$23.6
		Output	$88.7	$100.6	$69.6	$258.9	$86.3
Manufacture Wire	$49.1	*Employment*	78	162	158	399	133
		Labor Income	$6.8	$12.6	$8.8	$28.2	$9.4
		Output	$49.1	$70.9	$28.2	$148.2	$49.4
Architectural Services	$34.7	*Employment*	248	119	220	587	196
		Labor Income	$20.3	$7.5	$12.3	$40.1	$13.4
		Output	$34.7	$19.5	$39.2	$93.3	$31.1
Right of Way	$35.0	*Employment*	232	86	63	381	127
		Labor Income	$3.2	$4.7	$3.5	$11.4	$3.8
		Output	$35.0	$15.0	$11.0	$61.0	$20.3
Financial	$11.4	*Employment*	38	82	55	175	58
		Labor Income	$0.7	$6.0	$3.1	$9.8	$3.3
		Output	$11.4	$16.6	$9.8	$37.9	$12.6
Electric Power	$6.7	*Employment*	6	14	16	36	12
		Labor Income	$1.0	$1.0	$0.9	$2.9	$1.0
		Output	$6.7	$3.5	$2.9	$13.1	$4.4
Installation of Converters/ Transformers	$99.0	*Employment*	782	331	561	1,673	558
		Labor Income	$47.0	$24.0	$31.3	$102.2	$34.1
		Output	$99.0	$80.4	$99.9	$279.3	$93.1
Totals	$661.2	*Employment*	4,340	2,304	3,371	10,015	3,338
		Labor Income	$260.7	$164.2	$187.9	$612.8	$204.3
		Output	$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 998[8] 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	*Employment*[2]	1,490	631	1,095	3,216	1,072
		Labor Income[3]	$93.0	$45.7	$61.0	$199.7	$66.6
		Output	$192.3	$153.3	$194.9	$540.6	$180.2
Manufacture Structures	$50.7	*Employment*	171	219	223	614	205
		Labor Income	$12.5	$15.4	$12.5	$40.4	$13.5
		Output	$50.7	$57.4	$39.8	$147.9	$49.3
Manufacture Wire	$28.1	*Employment*	46	96	88	230	77
		Labor Income	$3.4	$7.4	$4.9	$15.7	$5.2
		Output	$28.1	$41.8	$15.7	$85.5	$28.5
Architectural Services	$19.8	*Employment*	138	66	126	331	110
		Labor Income	$11.8	$4.2	$7.0	$23.0	$7.7
		Output	$19.8	$10.9	$22.5	$53.2	$17.7
Right of Way	$20.0	*Employment*	126	47	35	208	69
		Labor Income	$1.8	$2.6	$2.0	$6.4	$2.1
		Output	$20.0	$8.3	$6.2	$34.5	$11.5
Financial	$6.5	*Employment*	19	42	30	91	30
		Labor Income	$0.6	$3.1	$1.7	$5.4	$1.8
		Output	$6.5	$8.4	$5.4	$20.4	$6.8
Electric Power	$3.8	*Employment*	4	8	9	21	7
		Labor Income	$0.6	$0.6	$0.5	$1.7	$0.6
		Output	$3.8	$2.1	$1.6	$7.5	$2.5
Installation of Converters/ Transformers	$33.0	*Employment*	256	108	188	552	184
		Labor Income	$16.0	$7.8	$10.5	$34.3	$11.4
		Output	$33.0	$26.3	$33.4	$92.8	$30.9
Totals	$354.2	*Employment*	2,250	1,218	1,795	5,263	1,754
		Labor Income	$139.7	$86.8	$100.1	$326.5	$108.8
		Output	$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	*Employment*[2]	1,355	574	1,122	3,051	1,017
		Labor Income[3]	$101.0	$41.5	$62.6	$205.1	$68.4
		Output	$192.3	$139.4	$199.9	$531.6	$177.2
Manufacture Structures	$50.7	*Employment*	161	206	230	596	199
		Labor Income	$14.2	$14.5	$12.8	$41.5	$13.8
		Output	$50.7	$54.1	$40.9	$145.6	$48.5
Manufacture Wire	$28.1	*Employment*	41	84	97	222	74
		Labor Income	$5.3	$6.6	$5.4	$17.4	$5.8
		Output	$28.1	$37.0	$17.3	$82.3	$27.4
Architectural Services	$19.8	*Employment*	135	65	127	326	109
		Labor Income	$12.0	$4.1	$7.1	$23.2	$7.7
		Output	$19.8	$10.6	$22.6	$53.0	$17.7
Right of Way	$20.0	*Employment*	93	34	31	158	53
		Labor Income	$2.0	$1.9	$1.7	$5.7	$1.9
		Output	$20.0	$6.3	$5.6	$31.8	$10.6
Financial	$6.5	*Employment*	18	38	29	85	28
		Labor Income	$0.8	$2.8	$1.6	$5.2	$1.7
		Output	$6.5	$7.7	$5.2	$19.5	$6.5
Electric Power	$3.8	*Employment*	3	7	9	19	6
		Labor Income	$0.6	$0.5	$0.5	$1.6	$0.5
		Output	$3.8	$1.8	$1.6	$7.2	$2.4
Installation of Converters/ Transformers	$99.0	*Employment*	697	295	578	1,570	523
		Labor Income	$52.0	$21.4	$32.2	$105.6	$35.2
		Output	$99.0	$71.8	$102.9	$273.6	$91.2
Totals	$420.2	*Employment*	2,502	1,303	2,223	6,028	2,009
		Labor Income	$188.0	$93.4	$123.9	$405.3	$135.1
		Output	$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]	Impact	Direct	Indirect	Induced	Total	Annual Average[4]
Manufacture Structures	$190.6	*Employment*[2]	630	808	848	2,286	762
		Labor Income[3]	$49.3	$56.8	$47.3	$153.3	$51.1
		Output	$190.6	$211.6	$151.0	$553.2	$184.4
Manufacture Wire	$105.5	*Employment*	161	335	351	847	282
		Labor Income	$16.9	$26.1	$19.5	$62.6	$20.9
		Output	$105.5	$146.6	$62.5	$314.5	$104.8
Manufacture of Transformers	$13.4	*Employment*	57	49	62	168	56
		Labor Income	$3.8	$3.9	$3.5	$11.2	$3.7
		Output	$13.4	$13.3	$11.1	$37.8	$12.6
Totals	$309.5	*Employment*	848	1,192	1,261	3,301	1,100
		Labor Income	$70.0	$86.8	$70.3	$227.1	$75.7
		Output	$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

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

Impact[1]	Kansas	Missouri	Illinois	Indiana	Four-State Region	U.S.
Employment[2]	135	70	88	3	296	383
Labor Income[3]	$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, Pittsburgh, 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
Armacell, 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
Transhield 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

		Kansas		Missouri		Illinois		Indiana	
Component	U.S.	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 Cost[1]	$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

Impacts[1]	Employment[2]	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.

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.

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.

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.

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.

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.

5.2.3 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.

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

Impact[1]	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 Impacts[1] of the Grain Belt Express Clean Line in Kansas, Missouri, Illinois, Indiana, and the United States

Impact[1]	Kansas	Missouri	Illinois	Indiana	U.S.
Employment[2]	135	70	88	3	383
Labor Income[3]	$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 Annual[1] Fiscal Impacts[2] 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 Impacts[1] 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 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.

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..

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. 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.

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.

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.