# Economic Impact Analysis of the Grain Belt Express Transmission Project on the States of Kansas, Missouri, and Illinois



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### About the Authors



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Dr. David G. Loomis is Professor of Economics at Illinois State University and Co-Founder of the Center for Renewable Energy. He has over 20 years of experience in the renewable energy and transmission fields and has performed economic analyses at the county, region, state and national levels for utilityscale wind and solar generation and high voltage transmission lines. He has served as a consultant for 43 renewable energy development companies. He has testified on the economic impacts of energy projects before the Illinois Commerce Commission, Iowa Utilities Board, Missouri Public Service Commission, Illinois Senate Energy and Environment Committee, the Wisconsin Public Service Commission, Kentucky Public Service Commission, Ohio Public Siting Board, and numerous county boards. Dr. Loomis is a widely recognized expert and has been quoted in the Wall Street Journal, Forbes Magazine, Associated Press, and Chicago Tribune as well as appearing on CNN.

Dr. Loomis has published over 38 peer-reviewed articles in leading energy policy and economics journals. He has raised and managed over \$7 million in grants and contracts from government, corporate and foundation sources. He received the 2011 Department of Energy's Midwestern Regional Wind Advocacy Award and the 2006 Best Wind Working Group Award. Dr. Loomis received his Ph.D. in economics from Temple University in 1995.



Bryan Loomis, MBA

Vice President of Strategic Economic Research, LLC

Bryan Loomis has three years of experience in economic impact, property tax, and land use analysis at Strategic Economic Research. He has performed over 50 wind and solar analyses in the last three years. He improved the property tax analysis methodology by researching various state taxing laws and implementing depreciation, taxing jurisdiction millage rates, and other factors into the tax analysis tool. Before working for SER, Bryan mentored and worked with over 30 startups to help them grow their businesses as CEO and Founder of his own marketing agency. Bryan received his MBA in Marketing from Belmont University in 2016.



Christopher Thankan assists with the production of the economic impact studies, including sourcing, analyzing, and graphing government data, and performing economic and property tax analysis for wind, solar and transmission projects. Thankan has a Bachelor of Science degree in Sustainable & Renewable Energy, and minored in economics.

Strategic Economic Research, LLC (SER) provides economic consulting for renewable energy projects across the US. We have produced over 150 economic impact reports in 28 states. Authors include Dr. David G. Loomis, PhD, Bryan Loomis, MBA, and Chris Thankan. Research Associates who performed work on this project include Ethan Loomis, Madison Schneider, Zoe Calio, Patrick Chen, Kate Kostrub, Kathryn Keithley, and Morgan Stong.



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### I. Executive Summary of Findings

Grain Belt Express is a high-voltage direct current (HVDC) transmission infrastructure project that will deliver electricity approximately 800 miles across states in the U.S. Midwest. The Grain Belt Express transmission line and new renewable energy generation facilities the line is expected to enable represent approximately \$20 billion in combined new energy infrastructure spending. Of this, the transmission line represents a \$7 billion investment by Invenergy Transmission.

The purpose of this Economic Impact Analysis Summary Report (Summary Report) is to aid decision makers in evaluating the total economic impact of these new energy facilities on the States of Kansas, Missouri, and Illinois. This Summary Report overviews the results from modeling of the primary states where the facilities are sited – Kansas, Missouri, and Illinois.<sup>1</sup> Separate, state-specific reports detailing results from the same modeling analysis have been filed with state regulatory agencies in Illinois<sup>2</sup> and Missouri.<sup>34</sup> This Summary Report publishes results from the modeling analysis including multi-state aggregate totals and state-level figures across all three states.

This comprehensive analysis estimates the direct, indirect, and induced impacts on jobs, earnings, and total economic output of the transmission line itself and new-build wind and solar energy projects based in southwest Kansas that the line is expected to enable.<sup>5</sup> The wind and solar impacts include construction, operations, and supply chain impacts for the State of Kansas but only supply chain impacts for the States of Illinois and Missouri. The analysis assumes that some of the Kansas wind farm and solar farm parts will be supplied by manufacturers in Missouri and Illinois. This analysis models economic impacts associated with the first 20 years of the project life.

Throughout this Summary Report, economic impact estimates reflect the low-end range modeling scenarios, taking the most conservative approach to reporting estimated economic impacts. Economic development impacts of the Grain Belt Express transmission line and new renewable generation facilities the line is expected to enable are summarized below and detailed further herein.

<sup>1</sup> Approximately 99.9% of the Grain Belt Express route miles are in Kansas, Missouri, and Illinois, with the remainder (an approximately 1.6-mile segment) in Indiana. Generation facilities enabled by Grain Belt Express are expected to be located in southwest Kansas.

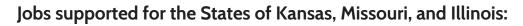
<sup>2</sup> Illinois report: https://www.icc.illinois.gov/docket/P2022-0499/documents/326522/files/568374.pdf

<sup>3</sup> Missouri report: https://efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=939656767

<sup>4</sup> Kansas report to be filed with the Kansas Corporation Commission in 2023.

<sup>5</sup> The transmission line impacts were modeled using IMPLAN software, the leading provider of economic impact data and analytical applications. The renewable generation impacts were modeled using JEDI, developed by the National Renewable Energy Laboratory. For more information on the methodology, please see the state reports.





- <u>Direct:</u> 22,294 direct jobs supported during construction and 437 permanent direct jobs supported during long-term operations
- <u>Direct, indirect, and induced:</u> 65,894 jobs supported during construction and 1,526 permanent jobs supported during long-term operations

All jobs figures are estimates of full-time equivalent (FTE) job-years. One FTE job-year represents 2,080 hours of work for one year, and part-time jobs are converted to FTEs in this report. The duration of project construction is anticipated to be three years. Dividing the total number of FTE job-years during construction by three yields the average expected annual employment supported during each year of construction. Long-term jobs indicate the expected employment supported annually for the duration of project operations.

#### Worker Earnings supported for the States of Kansas, Missouri, and Illinois:

- <u>Direct:</u> \$2.5 billion in direct worker earnings during construction and \$43.7 million in annual direct worker earnings during long-term operations
- <u>Direct, indirect, and induced:</u> \$5.2 billion in worker earnings during construction and \$104 million in annual worker earnings during long-term operations

Worker earnings include the wages, salary and benefits associated with the FTE jobs as identified above.

#### Economic Output supported for the States of Kansas, Missouri, and Illinois:

- <u>Direct:</u> \$2.5 billion in direct economic output during construction and \$43.7 million in annual direct economic output during long-term operations
- <u>Direct, indirect, and induced:</u> \$10.7 billion in economic output during construction and \$288 million in annual economic output during long-term operations

Economic Output is the value of goods and services produced for each in-state economy. It is an equivalent measure to the Gross Domestic Product. Economic Output includes Worker Earnings.



#### Grain Belt Express Transmission Line

The economic impacts of the transmission line used both IMPLAN and JEDI models to create these results. IMPLAN is the leading provider of economic impact data and analytical applications. The renewable generation impacts were modeled using JEDI, developed by the National Renewable Energy Laboratory. To learn more about the methodology used to create the results in this section, please refer to any of the state reports for the Grain Belt Express Transmission Line (see footnotes in the Executive Summary on p. 1).

Table 1, Table 2, and Table 3 show the results from these models for the transmission line. Table 1 lists the total employment impact from the transmission line for the States of Kansas, Missouri, and Illinois. Table 2 shows the impact on total earnings and Table 3 contains the impact on total output.

As shown in **Table 1**, new jobs created or retained during construction total over 8,628 for the State of Kansas, over 5,747 for the State of Missouri, and over 4,999 for the State of Illinois. New long-term jobs created from the transmission line total over 100 for the State of Kansas, over 105 for the State of Missouri, and over 34 for the State of Illinois.

	State of Kansas	State of Missouri	State of Illinois
Construction			
Direct	2,661	1,533	1,406
Indirect	2,670	1,737	1,406
Induced	3,297	2,477	2,187
Total	8,628	5,747	4,999
<b>Operations</b> (Annual)			
Direct	24	14	15
Indirect	49	61	3
Induced	27	30	16
Total	100	105	34

#### Table 1 – Total Employment Impact from the Transmission Line by State

Direct operations jobs will last the life of the Project. Direct jobs during construction as well as operations jobs require highly-skilled workers in the fields of construction, management, engineering, and facility operations and maintenance. These well-paid professionals boost economic development in rural communities where new employment opportunities often occur less frequently.





## Table 2 – Total Earnings Impact from the Transmission Line by State

	State of Kansas	State of Missouri	State of Illinois
Construction			
Direct	\$608,878,903	\$350,849,662	\$321,581,845
Indirect	\$158,679,336	\$107,040,679	\$107,993,987
Induced	\$168,631,790	\$128,227,990	\$135,911,197
Total	\$936,190,029	\$586,118,331	\$565,487,029
Operations (Annual)			
Direct	\$5,253,867	\$2,988,331	\$3,193,105
Indirect	\$2,376,512	\$3,572,642	\$421,089
Induced	\$1,378,538	\$1,552,104	\$981,513
Total	\$9,008,917	\$8,113,077	\$4,595,707

# Table 3 – Total Output Impact from the Transmission Line by State

	State of Kansas	State of Missouri	State of Illinois
Construction			
Direct	\$608,878,903	\$350,849,662	\$321,581,845
Indirect	\$391,671,825	\$244,914,640	\$234,860,482
Induced	\$527,118,322	\$390,350,914	\$385,884,469
Total	\$1,527,669,050	\$986,115,216	\$942,326,796
Operations (Annual)			
Direct	\$5,253,867	\$2,988,331	\$3,193,105
Indirect	\$7,008,728	\$8,119,938	\$1,363,878
Induced	\$4,304,124	\$4,717,146	\$2,782,100
Total	\$16,566,719	\$15,825,415	\$7,339,083

Accordingly, it is important to not just look at the number of jobs but also the earnings that they produce. Table 2 shows the earnings impacts from the transmission line, which is categorized by construction impacts and operations impacts. The new earnings during construction total over \$936 million for the State of Kansas, over \$586 million for the State of Missouri, and over \$565 million for the State of Illinois. The new long-term earnings totals over \$9.0 million annually for the State of Kansas, over \$8.1 million annually for the State of Missouri, and over \$4.5 million annually for the State of Illinois.

Output refers to economic activity or the value of production in a state or economy. It is an equivalent measure to the Gross Domestic Product, which measures output on a national basis. According to Table 3, the new output during construction totals over \$1.5 billion for the State of Kansas, over \$986 million for the State of Missouri, and over \$942 million for the State of Illinois. The new long-term output totals over \$16.5 million annually for the State of Kansas, over \$15.8 million annually for the State of Missouri, and over \$7.3 million annually for the State of Illinois.





#### New Renewable Energy Generation Enabled by Grain Belt Express

Grain Belt Express has the capability of transporting 5 gigawatts (GW) of power with an interconnection point on the western side of the transmission line near one of the highest quality combined wind and solar energy resources in the U.S. It is expected that new wind and solar facilities would be enabled by construction of the line. As a result of the strong local energy resource, the path to market represented by the line, and the variable and complementary nature of wind and solar energy production, it is anticipated that several additional GW of renewables matching and exceeding the line's capacity would be built, taking advantage of available capacity on the line based on an annualized hourly basis.

Accordingly, this analysis assumed a mix of 6 gigawatts of wind and 3.25 gigawatts of solar. To estimate the economic impacts of this enabled generation mix, this analysis assumed economic impacts associated with twelve 500-megawatt wind farms and thirteen 250-megawatt solar farms. We assumed that there were supply chain impacts in Illinois and Missouri for the wind farms but no supply chain impacts for the solar farms, based on the nature of the respective technologies' supply chains.

Table 4, Table 5, and Table 6 show the combined results from these models for the enabled wind and solar farms that would be connected by the Grain Belt Express Transmission Line. Table 4 lists the total employment impact from the wind and solar farms for the States of Kansas, Missouri, and Illinois. Table 5 shows the impact on total earnings and Table 6 contains the impact on total output.

#### from Enabled Renewable Generation by State State of State of State of Kansas Missouri Illinois Construction Direct 16,693 Indirect 20,047 925 1.019 Induced 7,024 344 468 Total 43,765 1,269 1,487 **Operations** (Annual) Direct 385 Indirect 567 Induced 335 Total 1,287

As shown in **Table 4**, new jobs created or retained during construction total over 43,765 for the State of Kansas, over 1,269 for the State of Missouri, and over 1,487 for the State of Illinois. The new long-term jobs created total over 1,287 for the State of Kansas.



Table 4 – Total Employment Impact



#### Table 5 – Total Earnings Impact from Enabled Renewable Generation by State

	State of Kansas	State of Missouri	State of Illinois
Construction			
Direct	\$1,236,319,733	-	-
Indirect	\$1,293,132,653	\$69,367,027	\$94,155,559
Induced	\$381,198,999	\$18,479,915	\$30,659,958
Total	\$2,910,651,385	\$87,846,942	\$124,815,517
Operations (Annual)			
Direct	\$32,268,863	-	-
Indirect	\$32,307,772	-	-
Induced	\$18,128,982	-	-
Total	\$82,705,617	_	-

**Table 5** shows the earnings impacts from the enabled wind and solar farms, which are categorized by construction impacts and operations impacts. The new earnings during construction totals over \$2.9 billion for the State of Kansas, over \$87.8 million for the State of Missouri, and over \$124 million for the State of Illinois. The new long-term earnings totals over \$82.7 million annually for the State of Kansas.

#### Table 6 – Total Output Impact from Enabled Renewable Generation by State

	State of Kansas	State of Missouri	State of Illinois
Construction			
Direct	\$1,291,577,604	-	-
Indirect	\$4,125,697,451	\$249,176,566	\$309,937,863
Induced	\$1,169,313,204	\$54,335,034	\$83,346,353
Total	\$6,586,588,258	\$303,511,600	\$393,284,216
Operations (Annual)			
Direct	\$32,268,863	-	-
Indirect	\$160,764,730	-	-
Induced	\$55,773,065	-	-
Total	\$248,806,658	-	-

According to **Table 6**, the new output during construction totals over \$6.5 billion for the State of Kansas, over \$303 million for the State of Missouri, and over \$393 million for the State of Illinois. The new longterm output totals over \$248 million annually for the State of Kansas.



#### Aggregate Economic Impacts Attributable to Grain Belt Express

**Table 7, Table 8, and Table 9** show the combined results for the Grain Belt Transmission Line and new renewable energy generation facilities the line is expected to enable. These tables show the results for construction and operation of the transmission line in Kansas, Missouri, and Illinois, as well as a mix of 6 gigawatts of new wind and 3.25 gigawatts of new solar built in Kansas.

As shown in **Table 7**, for the States of Kansas, Missouri, and Illinois, the new jobs created or retained during construction total 65,894, and the new long-term jobs created total 1,526.

**Table 8** shows the earnings impacts, which are categorized by construction impacts and operations impacts. For the States of Kansas, Missouri, and Illinois, the new earnings during construction total \$5.2 billion, and the new long-term earnings total \$104 million annually.

According to **Table 9**, for the States of Kansas, Missouri, and Illinois, the new output during construction totals \$10.7 billion, and the new long-term output totals \$288 million annually.

	State of Kansas	State of Missouri	State of Illinois	Total
Construction				
Direct	19,355	1,533	1,406	22,294
Indirect	22,716	2,661	2,426	27,802
Induced	10,322	2,822	2,655	15,798
Total	52,393	7,016	6,486	65,894
Operations				
Direct	409	14	15	437
Indirect	616	61	3	682
Induced	362	30	16	407
Total	1,387	105	34	1,526

#### Table 7 – Total Employment Impact from the Transmission Line and Enabled Generation



	State of Kansas	State of Missouri	State of Illinois	Total
Construction				
Direct	\$1,845,198,636	\$350,849,662	\$321,581,845	\$2,517,630,142
Indirect	\$1,451,811,989	\$176,407,705	\$202,149,546	\$1,830,369,240
Induced	\$549,830,789	\$146,707,906	\$166,571,155	\$863,109,851
Total	\$3,846,841,414	\$673,965,273	\$690,302,546	\$5,211,109,233
Operations (Annual)				
Direct	\$37,522,731	\$2,988,331	\$3,193,105	\$43,704,166
Indirect	\$34,684,283	\$3,572,642	\$421,089	\$38,678,016
Induced	\$19,507,520	\$1,552,104	\$981,513	\$22,041,136
Total	\$91,714,534	\$8,113,077	\$4,595,707	\$104,423,318

Table 8 – Total Earnings Impact from the Transmission Line and Enabled Generation

#### Table 9 – Total Output Impact from the Transmission Line and Enabled Generation

	State of Kansas	State of Missouri	State of Illinois	Total
Construction				
Direct	\$1,900,456,506	\$350,849,662	\$321,581,845	\$2,572,888,012
Indirect	\$4,517,369,275	\$494,091,207	\$544,798,345	\$5,556,258,827
Induced	\$1,696,431,526	\$444,685,949	\$469,230,822	\$2,610,348,297
Total	\$8,114,257,307	\$1,289,626,817	\$1,335,611,012	\$10,739,495,136
Operations (Annual)				
Direct	\$37,522,731	\$2,988,331	\$3,193,105	\$43,704,166
Indirect	\$167,773,457	\$8,119,938	\$1,363,878	\$177,257,274
Induced	\$60,077,189	\$4,717,146	\$2,782,100	\$67,576,435
Total	\$265,373,377	\$15,825,415	\$7,339,083	\$288,537,875



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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

<u>1996-present</u> 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.

<u>1997-present</u> 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.

2006-2018 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



**2007-2018** 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.

<u>2011-present</u> Strategic Economic Research, LLC President

- Performed economic impact analyses on policy initiatives and energy projects such as wind energy, solar energy, natural gas plants and transmission lines at the county and state level.
- Provided expert testimony before state legislative bodies, state public utility commissions, and county boards.
- Wrote telecommunications policy impact report comparing Illinois to other Midwestern states.

- Published 38 articles in leading journals such as AIMS Energy, Renewable Energy, National Renewable Energy Laboratory Technical Report, Electricity Journal, Energy Economics, Energy Policy, and many others
- Testified over 57 times in formal proceedings regarding wind, solar and transmission projects
- Raised over \$7.7 million in grants
- Raised over \$2.7 million in external funding



Bryan A. Loomis Strategic Economic Research, LLC Vice President

#### Education

Master of Business Administration (M.B.A.), Marketing and Healthcare, Belmont University, Nashville, Tennessee, 2017.

#### Experience

**2019-present** Strategic Economic Research, LLC, Bloomington, IL Vice President (2021-present) Property Tax Analysis and Land Use Director (2019-2021)

- Directed the property tax analysis by training other associates on the methodology and overseeing the process for over twenty states
- Improved the property tax analysis methodology by researching various state taxing laws and implementing depreciation, taxing jurisdiction millage rates, and other factors into the tax analysis tool
- Executed land use analyses by running Monte Carlo simulations of expected future profits from farming and comparing that to the solar lease
- Performed economic impact modeling using JEDI and IMPLAN tools
- Improved workflow processes by capturing all tasks associated with economic modeling and report-writing, and created automated templates in Asana workplace management software

<u>2019-2021</u> Viral Healthcare Founders LLC, Nashville, TN

CEO and Founder

- Founded and directed marketing agency for healthcare startups
- Managed three employees
- Mentored and worked with over 30 startups to help them grow their businesses
- Grew an email list to more than 2,000 and LinkedIn following to 3,500
- Created a Slack community and grew to 450 members
- Created weekly video content for distribution on Slack, LinkedIn and Email



Christopher Thankan Strategic Economic Research, LLC Economic Analyst

#### Education

Bachelor of Science in Sustainable & Renewable Energy (B.A.), Minor in Economics, Illinois State University, Normal, IL, 2021

#### Experience

2021-present Strategic Economic Research, LLC, Bloomington, IL Economic Analyst

- Create economic impact results on numerous renewable energy projects Feb 2021-Present
- Utilize IMPLAN multipliers along with NREL's JEDI model for analyses
- Review project cost Excel sheets
- Conduct property tax analysis for different US states
- Research taxation in states outside research portfolio
- Complete ad hoc research requests given by the president
- Hosted a webinar on how to run successful permitting hearings
- Research school funding and the impact of renewable energy on state aid to school districts
- Quality check coworkers JEDI models
- Started more accurate methodology for determining property taxes that became the main process used



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