



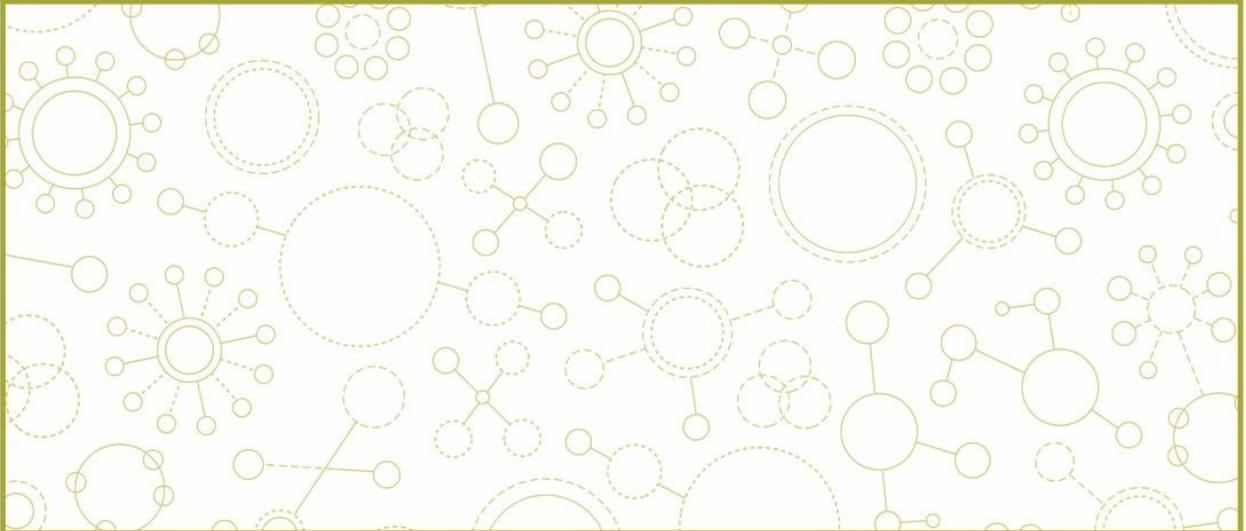
UNIVERSITY OF MINNESOTA EXTENSION

COMMUNITY VITALITY

Economic Contribution of Proposed Renewable Energy Projects in Minnesota

A REPORT OF THE ECONOMIC IMPACT ANALYSIS PROGRAM

Authored by Brigid Tuck



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Authored by Brigid Tuck, Senior Economic Impact Analyst, Center for Community Vitality

Editors: Elyse Paxton, Senior Editor, Center for Community Vitality

Report Reviewers:

Crystal Stiles (MBA), Senior Director, Economic Development, Florida Power and Light Company
Bruce Schwartau, Program Leader, Center for Community Vitality

Partner:

NextEra Energy Resources

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EXECUTIVE SUMMARY: ECONOMIC CONTRIBUTION OF RENEWABLE ENERGY PROJECTS IN MINNESOTA

As Minnesota diversifies its energy portfolio, companies are increasingly investing in renewable energy. NextEra Energy Resources (NextEra), which has already invested more than half a billion dollars in the state, plans to invest an additional \$1 billion in six wind energy development projects between 2020 and 2023.

As these projects advance, NextEra was interested in understanding the potential economic impact for the state. Thus, University of Minnesota Extension conducted an economic impact study. Economic impact is comprised of direct, indirect, and induced effects. To quantify the direct effects, NextEra provided Extension with its budget for construction and operations. Extension used the input-output model, IMPLAN, to calculate the indirect and induced effects. Major findings include:

Construction: NextEra, along with its local partners, plans to invest more than \$1.1 billion in wind energy projects during the next three years. Of this, an estimated \$321.1 million will be direct purchases from Minnesota companies. Much of the local investment is for site work, such as hiring local gravel companies to build roads and Minnesota construction workers to erect wind towers. The model estimates 1,840 workers will be employed to complete the construction work.

As a result of NextEra's \$321.1 million of direct investment, the wind investments will generate an estimated \$550.9 million of economic activity in Minnesota, including \$218.6 million in labor income. The projects will support 3,270 total jobs across all industry sectors, including jobs at the construction site and the multiplier effects. These effects will dissipate once construction ends.

Top sectors affected by the proposed development include real estate, health care, and professional and technical services. These one-time effects resulting from the construction activity flow to businesses, such as local health care providers giving routine care, engineers providing project support, and local diners feeding construction workers. In addition, the proposed projects will generate an estimated \$21.7 million in state and local tax collections during the construction phase.

Operations and Maintenance (O&M): Annually, NextEra and its partners will spend \$27.6 million to operate and maintain the wind projects. The companies anticipate employing 35 workers and paying nearly \$3.0 million in labor income (direct effect). While wages will vary based on experience and position, the average wage for O&M workers is expected to be \$69,000. In comparison, the 2019 state average wage was \$59,600. O&M jobs will also carry benefits.

In total, the wind projects will generate an estimated \$44.0 million in overall annual economic activity. This includes \$8.7 million in income to Minnesotans. The projects will support a total of 140 workers. These impacts will be annual as long as the projects operate at anticipated levels, totaling \$1.3 billion (unadjusted for inflation) throughout the anticipated 30-year operational life of the projects.

Top sectors affected by operations and maintenance include real estate, health care and insurance carriers. Like construction benefits, these are dollars flowing to Minnesota businesses that provide health care services, operate Main Street cafes, and provide professional services. In addition, the proposed wind energy projects will generate \$7.7 million in tax collections annually.

Projects in the Context of Minnesota's Economy: One in 10 construction workers (or 15,500 people) in Minnesota was still seeking employment in June due to the COVID-19 pandemic. The creation of 1,840 construction jobs presents an opportunity for employment for those seeking work. In addition, there will be ripple effects in sectors, such as health care and professional services, that may be valuable for those currently seeking employment.

INTRODUCTION

The improving economics of wind, solar, and energy storage combined with the increasing commitment to renewable energy by cities, states, and companies and the increasing costs of operating aging coal-fueled plants are driving significant changes in the nation's energy portfolio.¹ These trends are reflected in Minnesota as well.² In 2018, 37 percent of electricity generated in the state came from coal, down from 53 percent in 2011. This change resulted from the combination of a decline in coal-fueled production and an increase in other forms of power generation.³

As Minnesota diversifies its energy portfolio, companies are increasingly investing in renewable energy. NextEra, which has already invested more than half a billion in the state, plans to invest an additional \$1 billion to complete six wind energy projects between 2020 and 2023. In addition, NextEra has project partners with plans to invest in infrastructure upgrades related to the projects. The projects will add 880 MW of wind energy and are primarily proposed for sites in southern Minnesota.

As these projects advance, NextEra was interested in understanding the potential economic impact for the state. Thus, University of Minnesota Extension conducted an economic impact study. This report presents the full results of the analysis.

The proposed wind energy projects will contribute to the economy in two ways. First, NextEra and its project partners will invest in site development and wind tower erection. The economic impact of construction activities are shorter term in nature. They will dissipate once construction ends. Second, the wind energy projects will generate economic activity annually due to operations and maintenance. These impacts are longer term and will occur annually, as long as the projects operate at planned levels. Thus, Extension's analysis examined each effect separately.

Economic contribution is comprised of direct, indirect, and induced effects. Direct effect is the initial spending or investment by a business. This includes total expenditures (output), employment, and labor income. To quantify the direct effects, NextEra provided Extension with its budget for construction and operations.

Indirect and induced effects are often referred to as "ripple" effects. They account for the additional activity generated in the economy when companies spend money to buy inputs and pay their employees. Indirect effects are business-to-business effects. These occur when the companies purchase inputs. In turn, this causes their suppliers (including local businesses) to increase purchases. For example, during construction, the construction company will purchase items such as concrete and gravel. This will cause their suppliers to produce more and increase demand on that supply chain. Induced effects are consumer-to-business effects. These occur when companies pay their employees and the employees then spend their wages in the local economy.

Extension used the input-output model, IMPLAN, to calculate the indirect and induced effects of the proposed wind projects. Input-output models capture the flow of goods and services within an economy. Using this pattern, the model can show how a change in one part of the economy affects other parts of the economy.

¹ Pearl, L. (2020, January 13). 2020 outlook: 10 trends driving the US power sector. *Utility Dive*. Retrieved from <https://www.utilitydive.com/news/2020-outlook-10-trends-driving-the-us-power-sector/570189/>

² Dunbar, E. (2019, May 28). Minnesota's departure from coal will mean more natural gas, nuclear. MPR News. Retrieved from <https://www.mprnews.org/story/2019/05/28/minnesota-energy-pie-transition>

³ United States Energy Information Administration (n.d.). *Minnesota state profile and energy estimates*. Washington D.C. Retrieved from <https://www.eia.gov/state/?sid=MN#tabs-4>

ECONOMIC IMPACT OF CONSTRUCTION

Direct Effect

NextEra and its project partners plan to invest more than \$1.1 billion in Minnesota wind energy projects during the next three years. Of this, \$321.1 million is expected to be direct investment with Minnesota companies (Table 1). This is an important distinction, as only spending within Minnesota creates the indirect and induced effects.

The largest expenditures for wind development projects are wind turbines and transmission networks. NextEra and its partners plan to spend \$791.6 million on these two items. While Minnesota has been home to some wind turbine manufacturing, the state does not currently have a company that produces commercial-grade wind turbines. Thus, it is anticipated only a small fraction (\$11.4 million) of NextEra's spending on these items will be within the state, primarily in the form of components that go into turbine manufacturing.

"Balance of plant" is a second major expenditure. This category of expenses primarily includes site work, such as building roads and erecting wind towers. Since construction work will take place in Minnesota, all expenses are local to the state.

Finally, NextEra anticipates spending \$30.7 million on development. Development costs are primarily professional service expenses such as legal, engineering, permitting, and compliance. It is anticipated that most of this spending (\$23.5 million) will also be at Minnesota businesses.

Table 1: Direct Impact of Proposed Wind Energy Projects, Construction, 2020-2023 (Millions)

	Total	Minnesota
Wind turbines and transmission/network	\$791.6	\$11.4
Balance of plant	\$286.2	\$286.2
Development	\$30.7	\$23.5
Total	\$1,108.5	\$321.1

Total Impact

According to the IMPLAN model, \$321.1 million of investment in Minnesota will create 1,840 jobs. These are primarily construction jobs at wind tower sites, but they also include professionals, such as engineers and lawyers directly involved in the project.

In total, the wind investments will generate an estimated \$550.9 million of economic activity within Minnesota, including \$218.6 million of labor income (Table 2). The projects will support 3,270 total jobs across all industry sectors, including the direct jobs above and associated ripple effects, such as jobs at restaurants and in health care.

Table 2: Economic Contribution of Proposed Wind Energy Projects, Construction, 2020-2023

	Total	Minnesota Economic Impact		
		Output (Millions)	Employment	Labor Income (Millions)
Total investment	\$1,108.5			
Direct		\$321.1	1,840	\$137.6
Indirect		\$74.4	390	\$27.2
Induced		\$155.4	1,040	\$53.7
Total		\$550.9	3,270	\$218.5

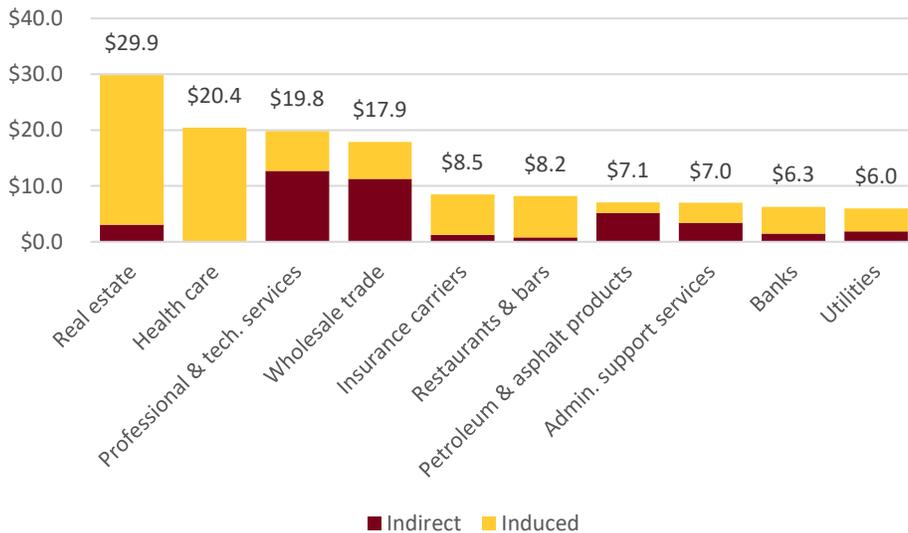
These above impacts are short term. As construction projects reach completion in late 2023, they will begin to dissipate. In addition, the table below summarizes the projects' impact throughout the construction period of 2020 to 2023, not the annual impacts.

Top Sectors Affected

The top sectors affected by the proposed development's direct effects include real estate, health care, and professional and technical services (Chart 1). These are one-time effects resulting from construction activity flow to businesses, such as local health care providers giving routine care, engineers providing project support, and local diners feeding construction workers.

Indirect effects are highest in professional and technical services, wholesale trade, and petroleum and asphalt products. These are sectors tied to the construction supply chain—for example, engineers and architects who are professional and technical service providers. Wholesale trade is the industry in which businesses purchase in bulk, a common practice for large construction firms. In this case, it might include new tires purchased by the trucking company hauling gravel to the site or tools purchased to install turbines.

Chart 1: Top Sectors Affected, Construction of Proposed Wind Energy Projects, Indirect and Induced Effects (Millions)



Induced effects are highest in real estate and health care. In this situation, they are particularly strong, partially because construction jobs pay relatively high wages. Housing and health care are major components of a household budget, so they often emerge as the highest impacts in these types of studies. Housing includes construction workers paying their mortgage or rent. Health care includes construction workers and their families accessing health care, such as routine office visits.

Tax Impacts

Finally, construction activities will generate tax collections at the state and local level. The projects will create an estimated total of \$21.7 million in taxes during construction. This includes \$6.6 million in income and \$6.6 million in sales taxes.

In Minnesota, income and sales taxes primarily go to the state. Property taxes are primarily for counties, cities, and school districts. There are exceptions to this, however—for example, there is an

optional local sales tax in some jurisdictions and the state provides local government aid to jurisdictions as well.

Table 3: Tax Impact of Proposed Wind Energy Projects, Construction, 2020-2023 (Millions)

Tax Category	Value (Millions)
Income	\$6.6
Sales	\$6.6
Property	\$5.4
Other	\$3.1
Total	\$21.7

ECONOMIC IMPACT OF OPERATIONS AND MAINTENANCE

Direct Effect

Annually, NextEra will spend \$27.6 million to operate and maintain its wind projects (Table 4). Of this, \$19.8 million is expected to be at Minnesota companies. Major expenses include operation and maintenance (O&M) costs, land payments, labor, and taxes. Under the umbrella of O&M are items such as replacement parts, fuel, insurance, utilities, fees and permits, and site maintenance.⁴ For purposes of this analysis, Extension modeled half the land payments as household income and half the land payments as real estate (assuming the landowner uses rental income to pay land loans).

NextEra anticipates employing 35 workers and paying nearly \$3.0 million in labor income. Wind energy O&M careers include wind technicians and site managers, among other occupations. While wages will vary based on experience and position, NextEra anticipates the average wage for O&M workers to be \$69,000. In comparison, the 2019 state average wage was \$59,600.⁵ The six wind projects are planned for southern Minnesota. By comparison, in southwest Minnesota, the 2019 average wage was \$42,000, and in southeast Minnesota it was \$53,200.

The proposed O&M jobs also carry benefits, which are included in the labor income total in this analysis.

Table 4: Direct Impact of Proposed Wind Energy Projects, Operations and Maintenance, Annual (Millions)

Expenditures	Total	Minnesota
Land payments	\$7.2	\$7.2
O&M costs	\$11.5	\$3.7
Labor	\$3.0	\$3.0
Taxes	\$5.9	\$5.9
Total Expenditures	\$27.6	\$19.8
Employment	35	35

Total Impact

In total, the six wind projects will generate an estimated \$44.0 million in overall annual economic activity (Table 5). This includes \$8.7 million in income to Minnesotans. The projects will support a

⁴ See appendix for details on how Extension modeled the O&M costs in IMPLAN.

⁵ Average weekly wage retrieved from the Department of Employment and Economic Development (DEED) Quarterly Census of Employment and Wages.

total of 140 workers. Of those workers, 35 are the direct jobs and 105 are across supporting industries.

Table 5: Economic Contribution of Proposed Wind Energy Projects, Operations and Maintenance

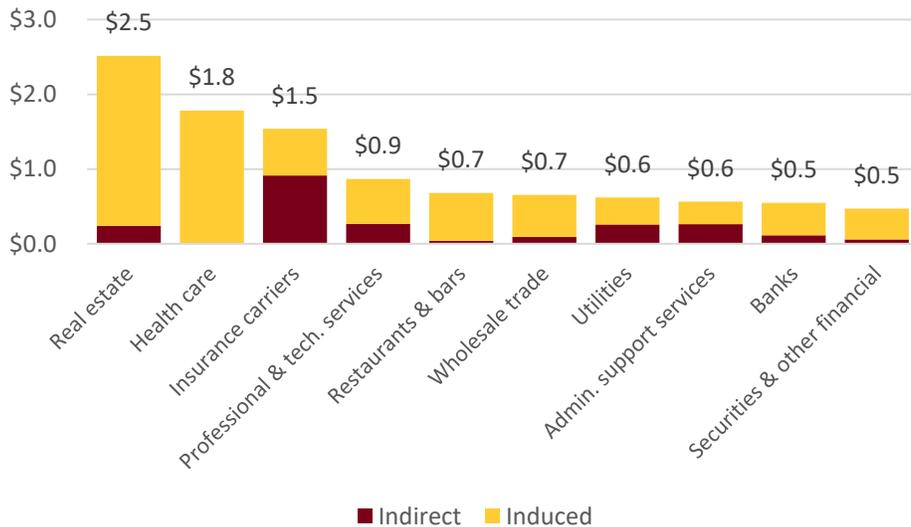
	Output (Millions)	Employment	Labor Income (Millions)
Direct	\$27.6	35	\$3.0
Indirect	\$3.1	17	\$1.1
Induced	\$13.3	88	\$4.6
Total	\$44.0	140	\$8.7

Top Sectors Affected

Top sectors affected by operations and maintenance include real estate, health care, and insurance carriers (Chart 2). Like construction benefits, these are dollars flowing to Minnesota businesses that provide health care services, operate Main Street cafes, and provide professional services. These impacts will be annual as long as the projects operate at anticipated levels, totaling \$1.3 billion (unadjusted for inflation) throughout the anticipated 30-year operational life of the projects.

The induced effects of NextEra’s annual spending are notable. Between wages paid to workers and land payments, the company will have a considerable amount of direct spending to Minnesota households. This triggers induced impacts in areas like real estate (housing) and health care. There are also Main Street impacts for business, such as restaurants, insurance agents, and professional service providers.

Chart 2: Top Sectors Affected, Proposed Wind Energy Projects, Operations & Maintenance, Indirect and Induced Effects (Millions)



Tax Impacts

Operations and maintenance will also generate tax receipts. NextEra anticipates spending \$6.3 million annually in property taxes (direct). In addition, spending by NextEra and its partners will create indirect and induced tax impacts. These are taxes paid by suppliers and workers as they make purchases.

In total, the proposed wind energy projects will generate \$7.7 million in tax collections annually (Table 6). During the 30-year life cycle of the projects, this would equate to \$230.8 million (not adjusted for inflation) in taxes.

Table 6: Tax Impact of Proposed Wind Energy Projects, Operations and Maintenance

Tax Category	Direct Taxes	Indirect and Induced	Total
Income		\$323,200	\$323,200
Sales		\$497,000	\$497,000
Property	\$6,273,000	\$404,000	\$6,677,000
Other		\$196,200	\$196,200
Total	\$6,273,000	\$1,420,400	\$7,693,400

GREAT RIVER ENERGY PROJECTS

Great River Energy provides electricity to 700,000 families, farms, and businesses in Minnesota. In May 2020, Great River Energy announced plans to purchase an additional 1,100 MW of wind energy by the end of 2023. To meet this goal, Great River Energy is partnering with NextEra on four of the six projects detailed in this report. The following section highlights the impact of Great River Energy-related projects.

Wind investments will generate an estimated \$438.6 million of economic activity within Minnesota, including \$173.2 million of labor income (Table 7). The projects will support 2,590 total jobs across all sectors, including direct jobs at the construction site and corresponding ripple effects. In addition, the proposed projects will generate an estimated \$16.5 million in state and local taxes.

Table 7: Economic Contribution of Great River Energy-Related Proposed Wind Energy Projects, Construction

	Total	Minnesota Economic Impact		
		Output (Millions)	Employment	Labor Income (Millions)
Total investment	\$882.1			
Direct		\$256.7	1,460	\$109.1
Indirect		\$58.8	310	\$21.5
Induced		\$123.1	820	\$42.6
Total		\$438.6	2,590	\$173.2

Once construction is complete, the projects will move into operations mode. The wind projects will generate an estimated \$32.7 million in overall annual economic activity from operations and maintenance (Table 8). This includes \$6.4 million in income to Minnesotans. The projects will



support a total of 105 workers across industry sectors, including the 25 direct jobs. In addition, the proposed wind energy projects will generate \$5.6 million in tax collections annually.

Table 8: Economic Contribution of Great River Energy-Related Proposed Wind Energy Projects, Operations and Maintenance

	Output (millions)	Employment	Labor Income (millions)
Direct	\$20.5	25	\$2.2
Indirect	\$2.3	10	\$0.8
Induced	\$9.9	70	\$3.4
Total	\$32.7	105	\$6.4

NOTES ON THE ANALYSIS

To conduct this study, Extension established parameters for its analysis. A few things related to wind energy and economics were not included in this report, but they are worth noting.

First, Minnesota is not home to commercial-grade wind turbine manufacturing. In a way, this is a missed opportunity, as a significant portion of expenditures by companies investing in wind energy projects are for the turbines. If Minnesota had a manufacturing plant and NextEra were to purchase from there, the economic impact of the wind projects would be significantly higher.

Second, NextEra anticipates it will purchase wind turbines for at least one of the projects from a manufacturing company located directly across the border in South Dakota. While the plant itself operates in South Dakota, some of its workers live in Minnesota. This means economic activity is generated in Minnesota due to these purchases. These impacts, however, are not included in this analysis.

Third, this analysis focused on the economic impact of construction, operations, and maintenance. However, economic researchers have identified additional economic impacts stemming from clean energy projects. Among them are decreased emissions, improved health outcomes, and potential cost savings to consumers.

Finally, as mentioned, the projects will generate tax collections, particularly from land payments. The IMPLAN model gives insight into how those taxes will flow—income, property, sales, and so forth. Extension, however, does not have enough data to truly illustrate the impact on Minnesota communities. In general, property taxes go to local governments—counties, cities, townships, and school districts. Income and sales tax largely flow to the state government, but even much of that comes back to communities. In 2018, 40 percent of Minnesota’s budget was for K-12 education and 30 percent for health care.⁶

WIND ENERGY PROJECTS IN CONTEXT OF MINNESOTA’S ECONOMY

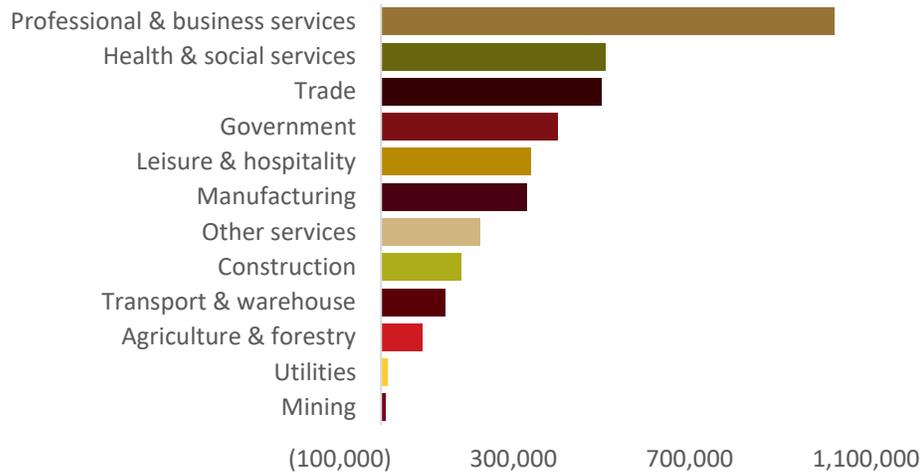
In 2017, businesses and enterprises employed 3.8 million workers in Minnesota. Major industry employers included professional and business services, health and social services, and trade (Chart 3). In the IMPLAN model, one job is one job, regardless if it is full-time, part-time, or seasonal. Thus,

⁶ https://mn.gov/mmb/assets/gov-rec-2018-general-fund-pie-charts_tcm1059-330540.pdf

industries like trade—that often have a high number of part-time employees—correspondingly also have a higher number of jobs compared to other industries, such as manufacturing.

The proposed wind energy projects’ multiplier effects are high in several of the professional and business services industry sectors—including real estate, insurance, professional and technical services, administrative and support services, and banking. Thus, in addition to construction effects, the new wind energy projects will help support and drive Minnesota’s largest industry.

Chart 3: Employment by Industry, Minnesota



During March 2020, the COVID-19 pandemic led to a slowdown in Minnesota’s economy. In April, Minnesotans filed an unprecedented 399,767 initial unemployment claims. In June 2020, there were 333,555 continuing unemployment claims. Continuing claims indicate people have started receiving benefits and continue to be unemployed.

Chart 4: Continuing Claims as a Percent of All Jobs by Industry, Minnesota, June 2020



Certain industries have been more impacted by the pandemic than others. For example, 26 percent of accommodation and food service industry employees were still on unemployment as of June (Chart 4). One in 10 construction workers (or 15,500 people) in Minnesota were still seeking employment in June. The creation of 1,840 construction jobs presents an opportunity for employment for those still seeking work.

In addition, there will be ripple effects in industries such as health care (also with 10 percent of jobs having claims) and professional services (with 17 percent of jobs having claims) that may be valuable for those currently seeking employment. As mentioned, the indirect and induced impacts will help support activity in a variety of professional and business services industry sectors, including banking, insurance, professional and technical services, and real estate.

APPENDIX: METHODS AND TERMS

Special models, called input-output models, exist to conduct economic contribution analysis. There are several input-output models available. IMPLAN (IMpact Analysis for PLANning) is one such model. Many economists use IMPLAN for economic contribution analysis because it can measure output and employment impacts, is available on a county-by-county basis, and is flexible for the user. IMPLAN has some limitations and qualifications, but it is one of the best tools available to economists for input-output modeling. Understanding the IMPLAN tool, its capabilities, and its limitations helps ensure the best results from the model.

One of the most critical aspects of understanding economic contribution analysis is the distinction between the local and non-local economy. The local economy is identified as part of the model-building process. Either the group requesting the study or the analyst defines the local area. Typically, the study area (the local economy) is a county or a group of counties that share economic linkages. In this study, the study area is the entire state of Minnesota.

A few definitions are essential to properly read the results of an IMPLAN analysis. These terms and their definitions are provided below.

Output

Output is the quantity of goods or services produced in a given time period by a firm, industry, or county, whether consumed or used for further production. The concept of national output is essential in the field of macroeconomics.

Output represents the value of industry production. In IMPLAN, these are annual production estimates for the year of the data set and are listed in producer prices. Output is measured in dollars and is equivalent to total sales.

Employment

Employment includes full- and part-time workers, as well as seasonal workers. Employment is measured in annual average jobs, not full-time equivalents (FTEs). IMPLAN includes total wage and salaried employees, as well as the self-employed, in employment estimates. Because employment is measured in jobs and not in dollar values, it tends to be a very stable metric.

Labor Income

Labor income includes all forms of employment income, including employee compensation (wages, salaries, and benefits) and proprietor income. Labor income measures the value added to the product by the labor component.

Direct Impact

Direct impact is equivalent to the initial activity in the economy. In this study, it is the expenditures by NextEra and its project partners.

Indirect Impact

The indirect impact is the summation of changes in the local economy that occur due to spending for inputs (goods and services) by the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, this implies a corresponding increase in output by the plant. As the plant increases output, it must also purchase more inputs, such as



electricity, steel, and equipment. As the plant increases its purchase of these items, its suppliers must also increase production, and so forth. As these ripples move through the economy, they can be captured and measured. Ripples related to the purchase of goods and services are indirect impacts.

Induced Impact

The induced impact is the summation of changes in the local economy that occur due to spending by labor; that is, spending by employees in the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, the new employees will have more money to purchase housing, buy groceries, and go out to dinner. As they spend their new income, more activity occurs in the local economy. This can be quantified and is called the induced impact.

Input-Output, Supply and Demand, and Size of Market

Care must be taken when using regional input-output models to ensure they are being used in the appropriate type of analysis. If input-output models are used to examine the impact or the contribution of an industry that is so large that its expansion or contraction results in such major shifts in supply and demand that prices of inputs and labor change, input-output can overstate the impacts or contributions. Care should be taken when interpreting the results.

Operations and Maintenance (O&M)

NextEra provided its projected O&M budget to Extension. In order to model this in IMPLAN, Extension needed a more detailed breakdown of costs. To obtain this information, Extension relied on the National Renewable Energy Laboratory's Jobs and Economic Development Impact (JEDI) model. The JEDI model is built on known data for wind energy projects and provides a detailed accounting of expenditures that can be entered into IMPLAN.

Analysis by Parts

Analysis by parts (ABP) is an IMPLAN modeling technique. ABP allows the analyst to enter each expenditure as its own category, as opposed to relying on a standard production function. Standard production functions are built into IMPLAN. For well-established industries with companies that follow a similar spending pattern, the production functions provide accurate estimates of spending. However, for developing industries or industries comprised of companies with differing spending patterns, analysis by parts provides a more accurate estimate, since the analyst enters spending data directly. Extension used ABP for this analysis.