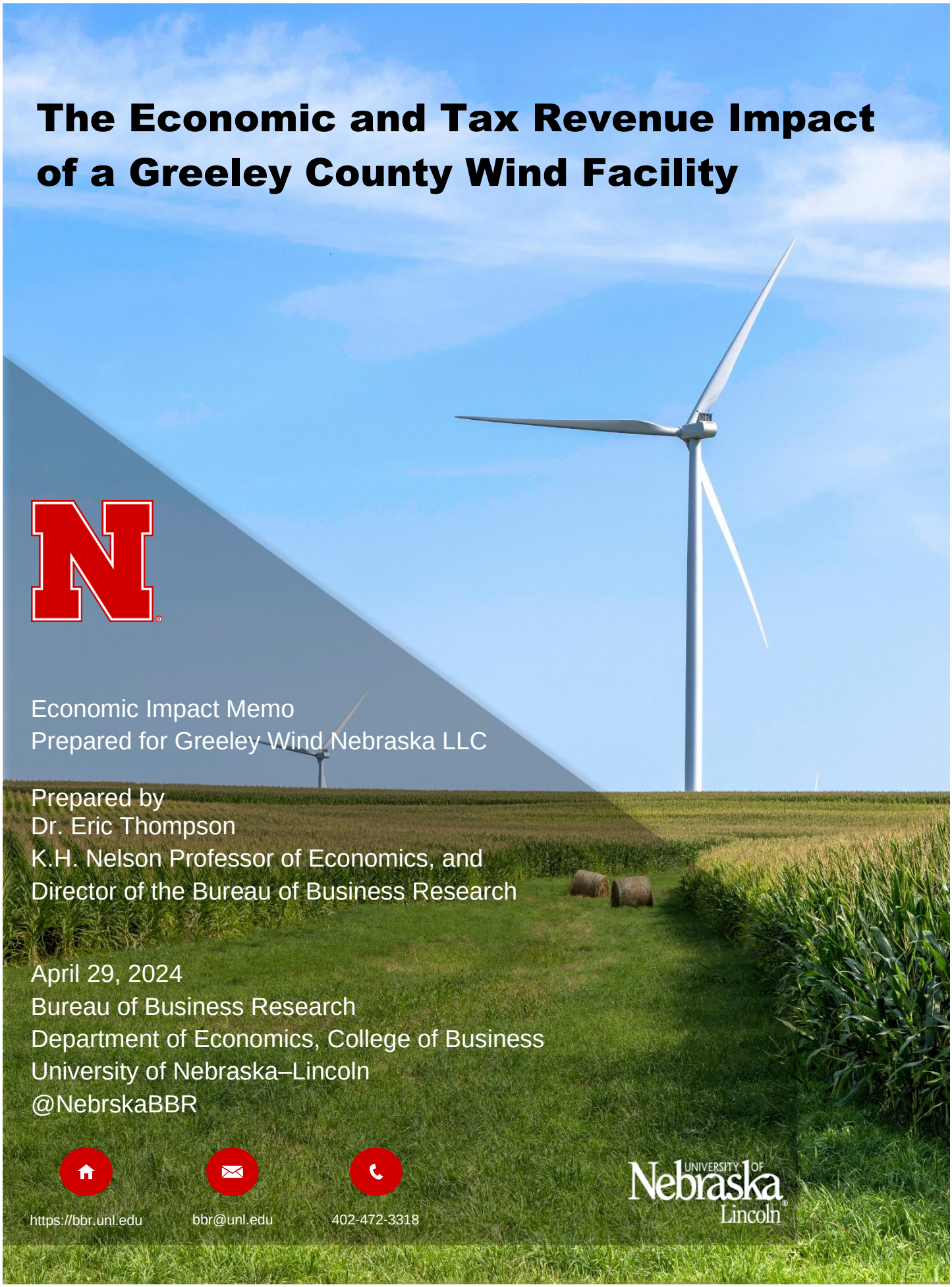
The Economic and Tax Revenue Impact of a Greeley County Wind Facility



Economic Impact Memo
Prepared for Greeley Wind Nebraska LLC

Prepared by
Dr. Eric Thompson
K.H. Nelson Professor of Economics, and
Director of the Bureau of Business Research

April 29, 2024

Bureau of Business Research
Department of Economics, College of Business
University of Nebraska–Lincoln
@NebrskaBBR

https://bbr.unl.edu bbr@unl.edu 402-472-3318

Table of Contents

List of Tables

Executive Summary

A 115-megawatt (“MW”) wind energy generation facility is to be built in Greeley County, Nebraska. This memo provides an estimate of the potential economic impact of the facility on Greeley and the surrounding region, both during the construction period and annual operations. There would be an economic impact of $51.6 million on the regional economy during the construction period, including 328 jobs. The annual economic impact during the facility’s multi-decade operation period would be $4.9 million in business activity each year, including $447,000 in labor income earned in 6.3 jobs. The annual tax revenue impact would be $579,000.

A. Introduction

This memo from the University of Nebraska-Lincoln Bureau of Business Research estimates the annual economic and tax revenue impact of a 115-megawatt (“MW”) wind energy generation facility in Greeley County, Nebraska. Estimates of the economic and tax revenue impact of the potential facility are provided for: 1) the development period when the wind facility is built and 2) during annual operations. Impacts are provided for a central Nebraska region that includes Boone, Garfield, Greeley, Hall, Howard, Merrick, Nance, Sherman, Valley, and Wheeler Counties in Nebraska. Economic impacts are presented in terms of output (business sales), labor income, and employment. Output provides the broadest measure of economic activity, while employment and labor income are key measures of the impact on the labor market. Note that labor income is a component of output, implying that the output and labor income impacts should not be summed together. Tax revenue impacts examine major local tax revenue sources, including the Nameplate Capacity Tax.

The economic impact of developing a wind facility occurs in two separate phases. First, there is a temporary impact in the development phase, during the year the wind facility is built. Greeley Wind Nebraska expects the wind farm to be ready for operation at the end of 2026, with a 1-year construction period. Second, there are annual impacts from the operation of the wind facility. Annual operation impacts typically occur for multiple decades. There is some loss of economic activity during both the development phase and the annual operations phase when crop and pastureland is taken out of production to make room for wind turbines, access roads, and other infrastructure, but the added economic activity from the facility substantially exceeds any loss.

Information provided by Greeley Wind Nebraska, the developer of the Greeley Wind Project, indicates that the facility will have 41 wind turbines and 115 MW of capacity. Projections for the year 2026 costs available from the *2020 Annual Technology Baseline Data Book* suggest a $157 million cost for development, including the cost of wind turbine components, infrastructure, and construction. Based on this size facility and development costs, there would be an estimated 232 jobs in the region during the development period. A majority of development costs would be to pay for wind turbine components that are manufactured outside of the region.

The UNL Bureau of Business Research estimates an annual operating cost of $4.6 million from the 115 MW facility.[1] Economic impact analysis also considers lost economic activity on agricultural land taken out of production, including pastureland as well as farmland utilized for corn and soybean production in Greeley County. Based on information provided by Greeley Wind Nebraska, 75% of such land for the project would be pastureland and 25% farmland.

Development costs and annual operating costs reflect the direct economic impact of the wind facility in the development phase and operations phase, respectively. Beyond these direct impacts, there are "multiplier" impacts on other local businesses during the development phase. due to spending by the owners of leased or purchased land, by construction workers during the development phase, and by wind facility employees during annual operations. The multiplier impact therefore reflects opportunities for other businesses and workers in the Central Nebraska region. Economic multiplier impacts are estimated utilizing the IMPLAN software, which can be used to estimate multipliers for specific geographies such as states, counties, or combinations of counties. The total economic impact of the wind project is the sum of the direct economic impact of the facility plus the multiplier impact on other regional businesses. Lost agricultural production reduces the direct, multiplier, and total economic impact of the wind facility.

Local tax revenue impacts flow primarily from the annual Nameplate Capacity Tax of $3,518 per MW of wind facility capacity. Local property tax revenue, however, also increases due to real property installed with wind turbines. These revenues flow directly to Greeley County, the Greeley schools, and other taxing jurisdictions in the county. In addition, there are property and sales taxes related to rising local income in the region.

[1] The UNL Bureau of Business Research utilizes a $40 per kW-year operating cost based on the National Renewable Energy Laboratory *2020 Annual Technology Baseline Data Book* .and the National Renewable Energy Laboratory *2021 Cost of Wind Energy Review.*

B. The Development Period Impact

Table 1 below summarizes the economic impact during the development period. The development period impact is based on an estimate that 23 percent of the total investment would be in the balance of facility, which includes improvements in infrastructure and construction work at wind turbine sites that will directly benefit the region. This figure excludes the cost of wind turbine components and associated contingencies but includes construction costs and the value of other infrastructure put in place at the facility. The analysis year is 2026 for the 1-year development period. There would be full-year equivalent 232 construction and assembly jobs in the region with estimated earnings of $15.2 million. A substantial portion of these earnings would likely be spent in the region including daytime spending in the community.

Analysis in Table 1 also subtracts the lost value of agricultural production during the year that the wind facility is developed. Wind turbines and associated access roads and other infrastructure utilize an average of 0.75 acres per MW of generation capacity, so the 115 MW facility will utilize approximately 86 acres of land. It is assumed these acres would have otherwise been utilized as pastureland or farmland producing corn or soybeans if the land had remained in agricultural production. USDA data suggests that Greeley County farmland is largely devoted to corn and soybeans. There would have been an estimated $33,000 in pasture and crop production on the land utilized for wind turbines and associated infrastructure during a year, based on annual production on pastureland and projected yields for 2026 and USDA forecast prices for corn and soybeans in that year.[2]

[2] Corn yields are estimated to grow by 1.9 bushels per acre from the mean value in the 2011 to 2020 period through 2026, based on Purdue University (available at http://www.kingcorn.org/news/ timeless/YieldTrends.html), while soybean yields are estimated to grow by 0.68 bushels per acre according to the University of Nebraska-Lincoln (https://cropwatch.unl.edu/soybeans/yields). Crop price projections for 2026 of $4.30/bushel for corn and $10.53/bushel for soybeans were taken from *USDA Agricultural Projections to 2031*. The potential annual value of an acre of pastureland for cattle grazing was estimated using 10-year prices averages and following the approach in "Estimating a Fair Value for Standing Forage," *Cornhusker Economics* (July 2020) by Jay Parsons, Daren Redfearn, Mary Drewnoski and Robert Tigner

Table 1 further shows the net direct economic impact of the development period, which is the impact of building the wind turbines and associated infrastructure less the impact of lost agricultural production. The net direct impact during the development period is $36.8 million in output, including $15.2 million in labor income spread over 232 jobs.

i. Multiplier Impact on Other Businesses

Also important is the multiplier impact during the development period, which is a measure of the impact on other businesses (besides the wind facility) and workers in the central Nebraska region. The multiplier impact of the multi-million-dollar investment for the balance of the facility is less than the direct impact, given that only a portion of the materials and construction services are purchased from businesses located in the central Nebraska region.

It is estimated that there will be $12.6 million in purchases from regional businesses. Payments to leaseholders who live in the region and wages to regional construction workers further support regional businesses as these households spend some of their income locally. In addition, out-of-state construction workers also pay rent or lodging and have a restaurant and miscellaneous spending. Greeley Wind Nebraska estimates that 75 percent of leaseholders live in the central Nebraska region, and it is estimated that 46 percent of construction workers would come from out of state given that they have specialized skills for building wind facilities. The remaining construction workers would come from the central Nebraska region including Greeley and other communities within a 50-mile radius. Construction workers from outside of Greeley would spend money in the community as well.

The multiplier impact from the wind power development is estimated to be $14.7 million in output during the development period, as seen in Table 1. As noted earlier, the multiplier impact is estimated using the IMPLAN model. Further, there is a lost multiplier impact of $0.01 million in output during the development period from lost crop production. The net multiplier impact on other Central Nebraska businesses is $14.7 million during the development period. This impact includes job and income opportunities for regional workers. Other central Nebraska businesses would add 96 jobs during the development period with labor income of $3.9 million. These jobs would be created in businesses throughout the economy as businesses purchase services and workers spend their paychecks. Table 1 further reports the total economic impact during the wind project development period. The total economic impact is the sum of the direct economic impact and the multiplier impact.

Table 1. Estimated Economic and Tax Revenue Impacts from Wind Facility Construction			
	Wind Facility Construction	Lost Agricultural Production	Net Impact
Direct Impact			
Output ($)	$36,866,000	-$33,000	$36,834,000
Labor Income ($)	$15,159,000	-5,000	$15,154,000
Jobs	232.4	-0.1	232.4
Multiplier Impact			
Output ($)	$14,739,000	-14,000	$14,725,000
Labor Income ($)	$3,855,000	-$3,000	$3,852,000
Jobs	95.9	-0.1	95.8
Total Impact			
Output ($)	$51,605,000	-$47,000	$51,558,000
Labor Income ($)	$19,014,000	-$8,000	$19,005,000
Jobs	328.3	-0.1	328.2

Source: UNL-BBR calculations utilizing the IMPLAN model.
Note: The direct impact and multiplier impact may not sum precisely to the total impact due to rounding. Likewise, the wind construction impact less the impact of lost agricultural production may not precisely sum to the net impact due to rounding.

C. The Impact of Annual Operations

The annual economic impact is determined by the yearly costs of operating a business, along with the size and wages of their workforce and purchases from local businesses. The net impact from utilizing an estimated 86 acres of cropland to locate 41 wind turbines and associated infrastructure therefore depends on the spending in each land use. Table 2 below shows the operating costs for a wind facility on each acre of land utilized, along with the revenue that would otherwise be generated by agricultural production. Each wind turbine has nearly 3 MW of generating capacity and with associated infrastructure will utilize 0.75 acres per MW of capacity.

Estimates in Table 2 are derived by dividing the $4.6 million in annual operations costs from the wind facility and $33,000 in revenue from agricultural production by 86 acres of land. The wind facility would generate an estimated $53,825 of annual operating cost spending per acre and the annual value of agricultural production is estimated at $380 per acre. There would be a net increase of $53,445 in operating cost spending per acre each year as agricultural land is used to house wind turbines and associated infrastructure. This suggests a net increase in economic impact although the impact also depends on the employment associated with each land use.

Table 2. Estimated Annual Cost Per Acre from Wind Facility Operations			
	Wind Facility Operations Cost	Lost Agricultural Production Revenue	Net Impact
Per Acre	$53,825	$380	$53,445
Source: UNL-BBR estimates based on USDA and Department of Energy data			

Table 3 shows the direct, multiplier and total economic impact of the annual operations of a 115 MW wind facility. Further, annual labor market impacts are provided in terms of employment and labor income. Finally, Table 3 shows local tax revenue impacts.

The 115 MW facility would directly employ 4.5 full-time equivalent workers from within the central Nebraska region with an estimated annual labor income of $380,000. Table 3 also shows multiplier impacts. The multiplier impacts reflect economic activity in the central Nebraska region generated due to 1) landowner spending on lease payments, participation payments to others in the area, donations to local organizations, and 2) the household spending of the workers who live within the central Nebraska region. The multiplier impact of annual operations is $311,000 in output, $75,000 in labor income, and 2.0 jobs. Table 3 also reports the lost multiplier impact of agricultural production.

The net multiplier impact from annual operations is the multiplier impact from wind facility operations less the lost multiplier impact from crop production as land use changes. The net multiplier impact is $296,000 in output each year, $72,000 in labor income, and 1.9 jobs. This represents the annual net increase in opportunities for other businesses in the central Nebraska region due to the operation of the Greeley Wind project.

Stated another way, the annual spillover of sales opportunities, employment, and labor income at other central Nebraska businesses is greater when the 86 acres of farmland are utilized for a wind facility than when the acres are used for agricultural production.

The net total economic impact on the region is $4.9 million per year during operations, including $447,000 in labor income spread over 6.3 jobs.

Table 3 further shows the Nameplate Capacity Tax paid to local governments from the 115 MW wind facility. The annual Nameplate Capacity Tax is $3,518 per MW in Nebraska. At that rate, a 115 MW facility would generate $405,000 each year in local tax revenue. Table 3 further shows local tax revenue from property and sales taxes. The development of the wind facility would not

change the assessed value of the 86 acres of agricultural land that would house the wind turbines and associated infrastructure but would increase the assessed value of real property in the region given the construction of foundation pads and roads, among other infrastructure, at each turbine location.

Table 3. Estimated Economic and Tax Revenue Impacts from Annual Operations of 115 MW Wind Facility

	Wind Facility Operations	Lost Agricultural Production	Net Impact
Direct Impact			
Output ($)	$4,642,000	-$33,000	$4,610,000
Labor Income ($)	$380,000	-5,000	$375,000
Jobs	4.5	-0.1	4.4
Multiplier Impact			
Output ($)	$311,000	-$14,000	$296,000
Labor Income ($)	$75,000	-$3,000	$72,000
Jobs	2.0	-0.1	1.9
Total Impact			
Output ($)	$4,953,000	-$47,000	$4,906,000
Labor Income ($)	$456,000	-$8,000	$447,000
Jobs	6.5	-0.1	6.3
Local Tax Revenue			
Nameplate Capacity Tax	$405,000	$0	$405,000
Other Property and Sales Taxes	$184,000	-$9,000	$174,000
Total	$588,800	-$9,000	$579,000

Source: UNL-BBR calculations utilizing the IMPLAN model.
Note: The direct impact and multiplier impact may not sum precisely to the total impact due to rounding. Likewise, the wind facility operations impact less the impact of lost agricultural production may not precisely sum to the net impact due to rounding.

The sales tax impact reflects sales in the central Nebraska region generated by additional income. There is approximately $0.35 in taxable purchases for each $1 of income in Nebraska, and the average local sales tax rate would be 1.75 percent across this central Nebraska region. In addition, there is $1.47 in taxable property value for each $1 of income in Nebraska. The net tax revenue impact for other local taxes is estimated at $174,000. Most of this increase is due to the increase in real taxable property at wind turbine sites.

The total annual net increase in local tax revenue from the Nameplate Capacity Tax and these other local taxes is estimated at 579,000.

Appendix A. About the Bureau of Business Research and Key Investigators

A. The Bureau of Business Research

The Bureau of Business Research is a leading source for analysis and information on Nebraska, the Midwest, and the national economy. The Bureau conducts both contract and sponsored research on the economy of states and communities including: 1) economic and fiscal impact analysis; 2) models of the structure and comparative advantage of the economy; 3) economic, fiscal, and demographic outlooks, and 4) assessments of how economic policy affects industry, labor markets, infrastructure, and the standard of living. The Bureau also competes for research funding from federal government agencies and private foundations from around the nation and contributes to the academic mission of the University of Nebraska-Lincoln through scholarly publication and the education of students. The Bureau website address is www.bbr.unl.edu.

B. Key Personnel

Dr. Eric Thompson (Principal Investigator)

Dr. Eric Thompson is the department chair and K. H. Nelson Professor of Economics and the director of the Bureau of Business Research at the University of Nebraska-Lincoln. He received his Ph.D. in Agricultural Economics from the University of Wisconsin-Madison with an emphasis on community economic development. He has served as Director of the Bureau of Business Research in the College of Business at the University of Nebraska-Lincoln since August 2004. Professor Thompson has published peer-reviewed articles in journals such as *the Journal of Regional Science, American Journal of Agricultural Economics*, and *Regional Science and Urban Economics*. Thompson has twice served as President of the Association for University Business and Economic Research (AUBER). Thompson has received over one hundred national and local grants from organizations such as the U.S. Departments of Transportation, Labor, and Agriculture, as well as the National Science Foundation, the Robert Wood Johnson Foundation and numerous Nebraska business organizations, non-profit organizations, state agencies, and local governments.