



ECONOMIC IMPACT ANALYSIS – WIND ENERGY

INTRODUCTION

This report estimates the economic impact of a proposed private wind energy electric power generation facility in North Carolina. It is not intended to indicate support for or against such a project by the North Carolina Department of Commerce (NCDOC). Rather, its purpose is to provide the potential economic impact of such a project. Results are estimates, and are derived from inputs provided by the company and in some cases based on forecasts.

The proposed wind energy power generation facility is expected to generate 300 megawatts of power at full capacity from one-hundred and fifty wind turbines. The company is expected to invest \$750 million¹ (\$712.5 million in tangible personal property (Machinery & Equipment) and \$37.5 million in real property construction). At full employment the facility will employ 19 people with an average annual wage in excess of \$100,000—more than double the median wage in North Carolina.

REGION OF ANALYSIS

The following analysis was conducted at the state level, as this was determined to be the best region to analyze for two reasons. First, the company has not chosen a specific project location in NC, and at this point does not know for certain which region of the state, let alone which county the facility will locate. Secondly, this project may require resources from across the state, and is likely to have wide-ranging geographic impacts. Reporting impact results at the state level was favored by both the North Carolina Department of Commerce and the company.

ANALYSIS ASSUMPTIONS & METHODOLOGY

The North Carolina Department of Commerce uses IMPLAN software for economic impact modeling. IMPLAN allows researchers to develop local level input-output models to estimate the economic impact of new firms moving into an area, plant closures, and many more activities. This model is widely used by local, state and federal government agencies as well as private industry and universities. The following table summarizes data and assumptions used in developing the economic impact model for this project.

¹ All monetary values are presented in 2010 dollars.

TABLE 1: PROJECT DETAILS AND MODEL ASSUMPTIONS

Project Location/ Economic Impact Area	North Carolina
IMPLAN Sector (Operations) ²	31 - Electric power generation, transmission, and distribution
IMPLAN Sector (Construction)	35 - Construction of new nonresidential manufacturing structures
IMPLAN Sector (Additional Spending)	369 - Architectural, engineering, and related services
Direct Job Creation (at full capacity)	19
Investment in Construction	\$37,500,000
Additional Investment Spending	\$7,125,000 - It is expected that 1% of total initial spending will be purchases from vendors/suppliers in North Carolina. Initial investment in NC is expected to mostly be in engineering services and site work for the facility.
Local Purchase Percent	100% - All construction and initial investment (occurring in NC) is expected to be purchased in the state. All power generation is expected to be purchased inside the state's borders, creating zero leakage.

While the vast majority of the firm's overall additional investment spending is wind turbines, these purchases will be from firms located outside the state. The company indicated 1% of overall initial investment will be purchased in North Carolina, and will come from engineering and site work services as well as non-specialty electrical needs such as wiring. Table 2 represents total investment and the employment schedule for project operations.

TABLE 2: PROJECT INVESTMENT AND OPERATIONS EMPLOYMENT SCHEDULE

Year	Real Property Construction	Initial Investment Purchased in NC (1% of firm's total)	Total Facility Operations Employment
2012	\$30,000,000	\$5,700,000	
2013	\$7,500,000	\$1,425,000	13
2014			
2015			
2016			6
Totals	\$37,500,000	\$7,125,000	19

Source: Application completed by firm, 4/13/10

Wind energy is a part of a larger IMPLAN industry sector titled "electric power generation, transmission, and distribution". In reviewing this industry's supply chain, carrying out research and through discussions with the company, it was determined the production function (commodity inputs) for this more general industry is different than the production function specific to wind energy generation. The more general industry is dominated by coal, natural gas, and nuclear facilities. In order to better represent the wind energy production function, NCDOC staff and the company worked to create a production function in

² The electric generation industry was modified to be more representative of the smaller wind power industry. In discussions with the firm and IMPLAN, MIG modelers it was determined this step needed to be taken in order to better represent the wind power industry as it differs substantially from the larger IMPLAN industry. In order to modify the industry, NCDOC worked with industry experts from the firm in order to create a more appropriate production function, worker productivity level and employee compensation.

IMPLAN³ specific to wind energy. Additional customization was done to match wage and employment data provided by the firm⁴.

Because a wind energy generation facility does not exist in North Carolina, it was determined the modeling results are not as exact as they would be if the industry already had a footprint. Therefore, sensitivity analysis was applied and multiple scenarios were considered. Results are presented as a range of potential values. Outliers on the low and the high end of the spectrum were removed.

ECONOMIC IMPACTS

This project consists of two analysis components: construction and investment to build the facility, and the operations associated with producing wind energy at the facility. Additionally, a third section discusses potential impacts to consider in the future that are outside the scope of this project.

KEY ECONOMIC IMPACT DEFINITIONS	<i>Source: www.implan.com</i>
Direct Impacts: The known or predicted change in the economy that is being studied. In this analysis the direct impacts are the changes associated with the development of the wind electric generation facility.	
Indirect Impact: Secondary impact caused to industries in the supply chain of the direct impact. In this case, facility operations would require purchases from North Carolina supplier firms, thus they would be indirectly impacted by this project.	
Induced Impact: Direct and indirect employment (and increases in labor income) creates additional household spending on goods and services.	
Employment: The number of full-time and part-time jobs; measured by place of employment. Employees, sole proprietors, and active partners are included, but unpaid family workers and volunteers are not.	
Labor Income: All forms of employment income, including employee compensation and proprietor income.	
Output: The amount of production, including all intermediate goods purchased, as well as value added (compensation and profit). Output is equal to sales in service industries and equal to sales plus the change in inventory for manufacturers.	
Value Added: Value added is the difference between total output and the cost of intermediate inputs. Value added is a measure of an individual producer, industry, or sector's contribution to the State's gross domestic product.	

CONSTRUCTION AND PERSONAL PROPERTY IMPACTS

Approximately 590 one-time jobs will result from facility construction, with more than 300 directly needed to construct the facility.⁵ Total labor income is expected to be \$26 million (an average of \$44,000 per employee). Construction of the facility will positively impact the state's gross domestic product by \$34 million and increase state output by over \$75 million.

Table 3: Total Economic Impacts from Construction and Initial Investment

One- Time Effects	Output	Value Added	Labor Income	Employment
Direct Effect	\$41	\$15	\$14.6	320
Indirect Effect	\$16	\$8	\$5.8	123
Induced Effect	\$17	\$10	\$5.4	147
Total	\$75	\$34	\$25.8	590

Source: MIG IMPLAN 3.0, Model Created May 2010. Dollar values are rounded to nearest million.

Note: Output, Value Added and Labor Income are presented in millions of dollars.

Labor income is rounded to the nearest \$100,000 and Output and Value Added to the nearest million.

³ This analysis is not fully robust, but is based on the assumption the firm has an extensive knowledge of the supply chain. As is often the case with emerging industries, vigorous validation of variables is not feasible.

⁴ The employment schedule coupled with the output estimates further indicates a high level of efficiency at this facility. The company indicated a significant economy of scale will be reached for this project size, and provided projects of comparable and larger sizes as justification.

⁵ Jobs are measured in job-years. For operations, it is reasonable to expect jobs to occur for successive years once stabilized employment is reached. However, construction and initial investment jobs are one-time occurrences. When the construction project is completed the jobs associated with the project will cease. Operations and construction impacts are not combined because of the different timeframes.

FACILITY OPERATIONS IMPACTS

The facility will directly employ 19 workers and is estimated to increase the state's gross domestic product by \$30 million annually at full employment⁶. An additional 29 to 120 indirect and induced jobs will be supported by the company's activities. At full employment, estimated total labor income for these multiplier jobs is between \$1.2 and \$4.5. These multiplier jobs are expected to increase the state's gross domestic product by \$2 to \$8 million, and increase state output by \$4 to \$14 million. The infancy of the industry in the state along with minimal year-to-year investment shows the majority of the project impacts will be direct effects rather than the multiplier effects.

Table 4: Annual Economic Impacts of Facility Operations

Year to Year Effects	Output	Value Added	Labor Income	Employment
Direct Effect ⁷	\$48	\$30	\$4.0	19
Indirect Effect	\$1 – 8	\$0 - 4	\$0.3 – 2.7	7-71
Induced Effect	\$3 – 6	\$1 - 3	\$0.8 – 1.8	22-49
Total	\$52 – 62	\$32 - 37	\$5.1 – 8.5	48-139

Source: MIG IMPLAN 3.0, Model Created May 2010. Dollar values are rounded to nearest million.

Note: Output, Value Added and Labor Income are presented in millions of dollars.

Labor income is rounded to the nearest \$100,000 and Output and Value Added to the nearest million.

IMPACTS BEYOND THE SCOPE OF THIS PROJECT

This project examines the economic impacts of a 300 Megawatt wind energy generation facility being constructed and operated in North Carolina, thus it is important to know this project analysis is not comprehensive and does not consider all benefits or all costs associated with the project. This analysis looks at the benefits in a standard economic perspective of jobs created and increases to state output. It does not place an economic value on this facility producing no greenhouse gas or harmful containments that other energy generating facilities may produce. Likewise, it does not value the initial development this facility would provide to the development of the “green economy”, or any other intrinsic benefits. The IMPLAN model is a static model, thus the scenario of enhancing the supply chain of green technology by locating an end product within the state is not considered in this model. Additions to the green energy supply chain are not likely to happen as a result of this project alone, but the development of this industry's value chain can only be enhanced by the addition of this facility in the state. Additionally, concerns regarding visual and noise pollution as a result of wind turbines, as well as other costs are not within the scope of this project.

CONCLUSIONS AND NEXT STEPS

The range for many of the variables is vast, and uncertainty exists as to the magnitude of the effect this project will have on the state. However, there are some significant takeaways known at this time.

- Nearly all of the \$750 million in upfront investment will be with firms located outside North Carolina.
- Large upfront investment generally indicates a firm will remain at the location for the long-term.

⁶ Of the four model scenarios considered, three presented direct effects at the top of the range for output, value added, labor income and employment. The one model at the lower end of the range used the standard energy industry without customization. The company provided output, labor income, and employment estimates. It stands to reason with regards to the direct effect, the true value is more likely to resemble the higher estimates. These are the direct effect results presented in Table 4 below, and hence why a range is not presented.

⁷ Direct Impacts were provided by the company in a written application. In conversations with the company, literature reviewed, and research conducted; the company assumptions were validated as appropriate.

- The employment impacts for a project with this much initial investment is small.
- There are other impacts worth considering that exist outside the scope of this project.
- A potential next step is to work with industry experts to more fully examine this project and others like it. As the industry continues to grow, the supply chain becomes more dynamic, partnering with a resource such as the North Carolina Solar Center would allow for more comprehensive cost-benefit analysis.

Disclaimer: Economic modeling can provide general impact estimates for economic development project. However, future results will be affected by political, social, and economic conditions. Economic modeling is most informative when used in conjunction with other forms of analysis, such as cost-benefit analysis and fiscal impact analysis, to estimate the overall impact of a project. The completion of this analysis by the North Carolina Department of Commerce is neither an endorsement for or against this facility. For additional information please contact Jared Wiener at (919) 715-4199.