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*The West Michigan Wind Assessment is a Michigan Sea Grant-funded project that is analyzing the benefits and challenges of utility-scale wind energy development in coastal West Michigan. More information about the project is available at [www.gvsu.edu/wind](www.gvsu.edu/wind).*

## Introduction

As West Michigan communities evaluate proposals to develop wind energy facilities, it is important to understand the potential economic impacts. This issue brief examines the potential economic benefits of developing wind energy facilities in West Michigan, including new employment related to construction and operation. However, wind power could have a variety of other effects on the West Michigan economy. For example, new wind energy facilities could influence the types of jobs available in the electricity industry, property values, air pollution levels, electricity prices and bat and bird mortality. A subsequent issue brief will discuss the economic implications of changing property values, human health impacts and wildlife effects. To fully understand the total impact of wind power on the region's economy, all of these effects need to be assessed and valued.

- *Developing wind power could have a variety of effects on the West Michigan economy, including additional spending and new employment.*

This issue brief explores the local economic impact of two hypothetical situations: (1) construction of a generic 100 megawatt (MW) onshore wind farm[1] in West Michigan, and (2) construction of all onshore wind projects currently proposed in the study area (Oceana, Muskegon, Ottawa and Allegan counties), which would together generate 519 MW of electricity.

## Benefits During Construction and Operation

Like other types of energy development, wind projects employ workers during both the construction and operation of wind turbines. During construction, significant economic benefits result from manufacturing the turbine components; however, most parts are currently made outside West Michigan and their production will generate economic activity in other communities. Recently more West Michigan companies have begun building turbine components, which could benefit the local community. For example,

[1] A 100 MW wind farm could produce enough electricity to supply about 30,000 homes. For more information on wind energy terminology, please see the Wind Energy Glossary on the West Michigan Wind Assessment web site (www.gvsu.edu/wind).

Energetx Composites of Holland, Mich. now manufactures turbine blades. In addition to component manufacturing, project planning, transportation of parts and on-site turbine construction will stimulate the local economy.

Once a wind farm is built, people will be employed to oversee and service the facility. The expected operational life of a wind farm is about 20 to 30 years [1]. This operational stage requires full-time technicians, administrators and managers to perform maintenance and service throughout the lifetime of the wind farm. Many of these skilled jobs may be based outside of West Michigan, but a local presence is also required.

- *Once a wind farm is built, technicians and administrators will be employed to maintain the facility.*

## Estimating Economic Impact of a Single Wind Farm

To predict how a proposed wind farm is likely to affect employment and the local economy, many people use a computer simulation called the Jobs and Economic Development Impact (JEDI) model [2]. The JEDI model was created by the National Renewable Energy Laboratory and has been featured in peer-reviewed publications, including an analysis of a renewable energy project in Michigan [3]. The JEDI model is an input-output model specifically designed to predict how spending on renewable energy projects (the input) will generate local benefits (the output). Input-output models, like the JEDI model, describe the relationships between different sectors of the economy and are an essential component of an economist's toolbox.

The West Michigan Wind Assessment team used the JEDI to estimate the potential economic impact of a hypothetical wind farm in the study area, including Oceana, Muskegon, Ottawa and Allegan counties. Because the JEDI model is based on national norms for wind energy projects, some adjustment is necessary when looking at West Michigan. We reviewed the typical goods and services associated with wind energy development and identified which could be purchased in West Michigan and which would be outsourced. The standard JEDI model configuration uses national-level economic development multipliers, which describe how spending in each industry is likely to impact the local economy. We modified the JEDI model to incorporate multipliers that more accurately reflect the West Michigan regional economy and the available goods and services.

- *Economic simulation models can help predict the number of local jobs generated as a result of new wind power facilities.*

The West Michigan Wind Assessment team ran the JEDI model under two scenarios. The first model scenario assumed that all wind turbine components were manufactured outside of West Michigan. The results for a generic 100 MW wind farm are shown in Table 1. The construction phase, which typically lasts about a year, is estimated to result in 369 job-years[2] or 3.7 jobs per MW of installed capacity. These workers would spend enough money in the local economy to support 123 jobs elsewhere in the economy, which is called an "induced impact." The operational phase of the project is estimated to support 14 jobs each year and these employees would spend enough money in the local economy to support an additional 16 jobs elsewhere in the economy for a total of 0.3 jobs per MW of installed capacity.

[2] A **Job-year** is the equivalent of one job for one year.

| During Construction Period | Jobs | Output |
|---|---|---|
| Project Development and Onsite Labor Impacts | 75 | $4,794,040 |
| Turbine and Supply Chain Impacts | 294 | $36,694,178 |
| Induced Impacts | 123 | $13,214,710 |
| **Total Construction Period Impacts** | **492** | **$54,702,929** |

| During Operating Years (annual) | Jobs | Output |
|---|---|---|
| Onsite Labor Impacts | 6 | $413,992 |
| Local Revenue and Supply Chain Impacts | 8 | $2,996,326 |
| Induced Impacts | 16 | $1,665,776 |
| **Total Annual Operating Period Impacts** | **30** | **$5,076,094** |

- *A single 100 MW wind project could generate 492 local jobs during construction and 30 jobs during the operating period.*

**Table 1: Predicted economic impact of building and operating a 100 MW wind farm in West Michigan, assuming none of the turbine components were built locally.**

The second model scenario included more local manufacturing. As noted previously in this paper, several West Michigan firms have increased their capability to manufacture wind turbine blades and components. As a result it is — or soon will — possible to purchase 100 percent of the blades and about 10 percent of the turbine components from suppliers in West Michigan.

If the same hypothetical 100 MW project were to use these local turbine components, then the number of local jobs created during construction would increase by more than 40 percent to 674, as seen in Table 2. In addition, the total economic impact for West Michigan, which is called output, would increase by more than 80 percent. As more wind energy facilities are constructed in the Midwest it will become easier for manufacturers to locate in Michigan. Therefore policies that promote new wind farms will also lead to greater manufacturing and an increase in local jobs. Locally manufactured turbine components will not change the benefits generated during wind farm operation, therefore, operating-period impacts are not repeated in Table 2.

- *If some wind turbine components were built locally, a new 100 MW wind project could generate 674 local jobs.*

| During Construction Period | Jobs | Output |
|---|---|---|
| Project Development and Onsite Labor Impacts | 67 | $4,949,050 |
| Turbine and Supply Chain Impacts | 421 | $68,401,540 |
| Induced Impacts | 186 | $19,894,402 |
| **Total Construction Period Impacts** | **674** | **$93,244,992** |

**Table 2: Predicted economic impact of building and operating a 100 MW wind farm in West Michigan, assuming 100% of the turbine blades and 10% of other components were manufactured locally.**

- *The four onshore wind projects currently proposed in West Michigan could generate thousands of jobs during construction and 155 long-term, local jobs.*

## Economic Development from Four Proposed Projects

In July 2010 the Midwest Independent System Operator (MISO) website [4] reported there was the potential for 519 MW of new onshore wind projects in the West Michigan study area. These are projects which developers intend to build and have reserved a spot in the electricity grid interconnection queue, though not all of them may be built. The MISO queue only lists the size and county of the projects — no additional information is available. This is an estimate of what could be built, not what will be built. The proposed projects include a 300 MW project in Oceana County, a 120 MW project in Ottawa County, a 99 MW project in Allegan County, and a 150 MW project in Muskegon County. The total economic development impact of all of these projects is shown in Table 3.

| | No Locally Manufactured Components | | 10% Local Components and 100% Local Blades | |
|---|---|---|---|---|
| | **Jobs** | **Output** | **Jobs** | **Output** |
| **Construction Period Impacts** | 2,551 | $283,908,2023 | 3,498 | $483,941,507 |
| **Annual Operating Period Impacts** | 155 | $26,344,928 | 155 | $26,344,928 |

**Table 3: Economic impact of 519 MW of potential wind projects in the four-county study area.**

- *These economic predictions do not take into account how wind farms might affect overall employment in the electricity industry, property values or air pollution.*

These economic predictions provide a good idea of how large the wind industry could become in the near term, if new wind farms are built. However, these estimates do not take into account how wind farms might affect employment in traditional electricity production (the net effect on employment) or the external costs and benefits of wind energy development (such as property values or pollution). A separate issue brief (#6) examines the external costs and benefits of wind farms.

Few studies have used such tools like the JEDI model to assess the effects of completed projects [5]. One study that did address the post-construction economic impact found that wind energy projects were associated with 0.86 jobs per MW of installed capacity, which is larger than what was estimated in Table 1 (0.3 jobs per MW) [6]. This suggests that the JEDI model produced a conservative estimate of the likely economic impacts for West Michigan.

Our economic predictions are consistent with results generated from other tools. These JEDI results were compared to a Regional Input-Output Modeling System (RIMS II) model [7] used to study regional development effects. Like the JEDI model, the RIMS II model was adjusted to reflect the West Michigan regional economy using the Kent, Ottawa, Muskegon and Allegan multipliers from the Bureau of Labor Statistics.

The result from the modified JEDI model was within 7 percent of the results obtained using the RIMS II model. This provides reassurance that the JEDI model generated results appropriate to West Michigan. If other data become available, a comparison with the results of the models and an actual wind farm construction site in Michigan can be carried out in the future to confirm the validity of the models.

- *Models predict that more of the spending associated with running a wind farm stays in the local economy when compared to operating a similar sized coal-fired plant.*

Wind energy development will support local jobs; however, over time, the region may see a decrease in employment in the coal and natural gas sectors. The locally calibrated economic model developed by this project found that 46 percent of spending to operate a wind farm stays in the region, compared with only 41 percent for a comparable natural gas or coal plant. This is because most coal and gas is purchased from out of state, generating little income for West Michigan businesses. This difference means that over the course of a year, a 100 MW wind energy facility would result in $2.6 million more being spent locally than would be generated by a 100 MW coal or natural gas plant. Money spent locally can support a variety of businesses and jobs in West Michigan.

## Summary

Economic analyses conducted by the West Michigan Wind Assessment indicate that wind energy development could generate economic benefits and new employment in West Michigan; however, much of the economic activity occurs during construction and the local benefits depend on how many turbine parts are manufactured locally. As the wind industry grows in Michigan, a higher portion of the spending to construct new wind facilities could remain in the state.

Building and operating all of the proposed wind projects in West Michigan (totaling 519 MW) would produce nearly 3,500 jobs during construction and 155 continuing jobs if some of the components were produced locally. The local economic impact would total $480 million during the construction phase and more than $25 million each year during operation.

New wind energy jobs could replace other jobs in the electricity industry. Economic models indicate that more of the money stays in the community when electricity is produced by local wind energy facilities when compared with electricity produced by local coal or natural gas-fired plants, which typically purchase fuel from outside Michigan. Thus, overall, wind energy generates more economic benefits for the local economy than traditional electricity generation.

## References


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