



ECONOMIC AND SOCIOECONOMIC

Impacts of Utility-Scale Wind Power Projects

Available at:

www.powernaturally.org

October 2005

NYS Energy Research & Development Authority

17 Columbia Circle

Albany, NY 12203-6399

www.nyserda.org

Prepared by:

Global Energy Concepts

This is one of a series of reports and guides that are all part of the NYSERDA Wind Energy Tool. Interested parties can find all the components of the kit at: www.powernaturally.org. All sections are free and downloadable, and we encourage their production in hard copy for distribution to interested parties, for use in public meetings on wind, etc.

Any questions about the tool kit, its use and availability should be directed to: Vicki Colello; vac@nyserda.org; 518-862-1090, ext. 3273.

In addition, other reports and information about Wind Energy can be found at www.powernaturally.org in the on-line library under “Large Wind.”

NOTICE

This report was prepared by Global Energy Concepts (GEC) in the course of performing work contracted for and sponsored by the New York State Energy Research and Development Authority (hereafter “NYSERDA”). The opinions expressed in this report do not necessarily reflect those of NYSERDA or the State of New York, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it. Further, NYSERDA, the State of New York, and the contractor make no warranties or representations, expressed or implied, as to the fitness for particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report. NYSERDA, the State of New York, and the contractor make no representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned rights and will assume no liability for any loss, injury, or damage resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this report.

Table of Contents

Introduction.....	4
Economic and Socioeconomic Impacts	4
Direct economic Impacts	4
Land Owner Revenue.....	4
Property Taxes	5
Job Creation.....	5
Construction Employment.....	5
O&M Employment	6
Manufacturing Employment	7
Development of Regional Cooperatives.....	8
Indirect economic Impacts	8
Economic impacts: a New York State example	9
Socioeconomic Impacts.....	10
Conclusion.....	11
Additional Sources of Information	12

Economic and Socioeconomic Impacts of Utility-Scale Wind Power Projects

Introduction

Any business development will have both direct and indirect economic impacts on the local and regional economies, and wind energy projects are no different. A new wind project directly affects an area through the purchase of goods and services, generation of land use revenue, taxes or payments in lieu of taxes, and employment. Secondary or indirect economic effects may include increased spending power, economic diversification, changes in property values and the use of indigenous resources.

Socioeconomic impacts are more difficult to quantify, but may include impacts to local culture and customs, land use, scenic, recreational and ecological resources, infrastructure, emergency personnel and systems, and education.

Typically, a proposed wind project will affect its host community in a number of ways, some positive, some negative. Whether any single impact is viewed as a benefit or a drawback depends a good deal on the perspective of the viewer. In considering whether to permit the development of a wind farm, it is up to the community to weigh all the impacts, and decide whether the positives outweigh the negatives. This guide is designed to help communities through this process.

Direct Economic Impacts

Direct economic effects from the development of a wind project include land owner revenue, revenues to local governments from property or other taxes, the creation of jobs, and the use of local services.

Land Owner Revenue

The development of a wind project can increase the productivity of the land and provide an additional source of income to rural land owners from leasing and royalty agreements (see Landowners' Leasing Guide section of this tool kit). Wind turbines occupy 4% or less of the land area required for a wind power project and because only a fraction of this land is utilized by physical plant structures and roads, the previous use of the land (e.g., ranching or farming) typically continues alongside the wind power facility.

Depending on the placement of the turbines on one or more properties, the project may directly benefit one or more landowners through leases and royalties. In addition to these direct benefits, the broader community may also benefit. This is due to multiplier effects associated with the increased income of the host landowners, and to the increased long-term stability of those landowners, who have diversified their sources of income.

Property Taxes

Property taxes or annual payments in lieu of taxes (PILOT) from a wind power project also significantly impact the community. In many locations, wind projects can be among the highest paying property tax entities. Based on information from Madison County, New York, voluntary payments from the Madison Wind Power Project amount to approximately \$30,000 per year each for both the town of Madison and the Madison Central School District, or approximately \$5,200 per MW. The Fenner Wind Power Project is providing the town of Fenner with approximately \$150,000 per year for 15 years, or approximately \$5,000 per MW. The Flat Rock (Maple Ridge) Wind Project in Lewis County is expected to result in a substantial increase in annual tax revenue for the county. Annual payments are anticipated to be over \$8 million from the project. This large amount is due in part to the location of the project in an Empire Zone.¹ Even without the Empire Zone benefits, the project would still pay more than \$1 million annually in PILOT payments. The largest beneficiaries of the added revenue will be the towns and schools.

Job Creation

As with most business ventures, wind energy projects create jobs. In general, the employment opportunities associated with a wind power plant are in construction, operations and maintenance (O&M), and manufacturing. Various studies have shown that, compared to conventional generation options, wind development creates more jobs per dollar invested and per kWh generated. It should be noted that most wind energy jobs are in the manufacturing, construction and installation fields, with relatively few jobs in ongoing operations and maintenance.

Construction Employment

Construction-related employment for a wind power project usually involves short-term assignments during the construction of the project. Construction time for a large wind project depends on the size and location of the project, but averages six months. In the

¹ Under a New York State initiative, sales tax exemption, real property and business tax credits are available for qualified businesses locating and expanding in designated Empire Zones.

United States, a 50-MW wind project will create the equivalent of 40 full-time jobs during the construction period. A typical arrangement will be for the developer or turbine manufacturer to hire (or serve as) a general contractor familiar with building wind projects. Responsible for overall project construction activities, the general contractor hires subcontractors experienced in civil work (grading, excavation, and concrete), electrical work, and mechanical assembly. Typical personnel requirements include construction managers, electricians, heavy equipment operators, security personnel, and general laborers for assembly and civil work. The number of positions that might be filled by local personnel depends upon the skill base of the local population and the policies and location of the construction or contracting company.

O&M Employment

The number of people employed by a wind power project during commercial operation depends primarily on the project size and administrative structure. Small projects of less than 10 turbines are generally remotely operated and bring in maintenance personnel only when maintenance is required. Larger projects will have a full-time staff, the size of which depends on the project size, turbine type, and local labor practices. Economies of scale are realized in both turbine size and quantity. Although some maintenance activities on the larger turbines may require more time or different equipment, many maintenance activities require approximately the same level of effort regardless of the turbine size, so a few large turbines are cheaper to maintain than many small ones.

Wind turbines typically have regular maintenance scheduled every six months. In the U.S., each scheduled service typically requires two people for one 8-hour period for turbines in the 500 kW to 1,500 kW (1.5 MW) size range. For six large projects in the U. S. (between 25 and 100 MW) with turbines of 750 kW or greater, approximately 1 full-time maintenance job was created for every 5 to 8 MW of installed capacity.

Wind projects are usually staffed with primarily local personnel, with an experienced supervisor or facility manager supporting the locally hired employees. The number of local employees hired will depend on available skills and training. Skills that project managers and operators must have include computer literacy, inventory management, job and equipment scheduling, performance record-keeping, statistical trend analysis, and data processing. Maintenance personnel generally need to be proficient mechanics or electrical/electronic technicians. With these skills they can readily be trained in wind power mechanical and electrical systems and maintenance equipment. Specialized turbine training is often provided by the turbine manufacturer.

Skills in each of the following areas need to be available to successfully maintain a wind power project.

- Hydraulics
- Rotating machinery
- Cranes and other heavy lifting equipment

- Composites repair (i.e., fiberglass)
- Electronic controls
- Power electronics
- Medium- and high-voltage electrical equipment
- Safe climbing and maintenance procedures

Once the project begins operation, the majority of the maintenance activities require climbing the tower and working within the confines of the nacelle and hub. This type of physical activity requires agility and strength, similar to the skills of an electric utility lineman. This is physically demanding work, and finding and retaining the proper combination of people who can both tolerate the physical demands and have the skills required to maintain modern turbines can be challenging. The physical demands of the job can result in high turnover.

Manufacturing Employment

The majority of commercial wind turbines are manufactured in Europe and the U.S.; however, the use of the term “manufacturing” is somewhat misleading. Although some turbine manufacturers build many of their own components, others are better described as “assemblers” because the major components of their turbines are produced by other companies and then assembled into their wind turbine model. The American Wind Energy Association (AWEA) estimates that wind turbine and component manufacturers directly contribute to the economies of 44 states. These companies manufacture and market towers, gearboxes, blades, monitoring equipment, and other wind energy-related equipment.

Manufacturers sometimes source individual components locally, depending on the local skills and resources. Towers, for example, are difficult and expensive to transport. As a result, towers are frequently the first turbine component to be manufactured locally in a developing wind power market. Tower fabrication requires capabilities similar to that required for manufacturing large steel storage tanks and towers for other purposes, increasing the probability that local businesses can grow into tower manufacturing with minimal new investment in the plant, equipment, and training. Cabling, transformers, concrete, and other project components may also be easily sourced locally.

While the number of manufacturing jobs created will depend on the manufacturing capabilities of the area, the incentives provided, and the size of the market, among other factors, the employment resulting from component manufacturing can be significant. For example, a wind turbine blade manufacturing facility to be located in Quebec will have a capacity of 240 MW (approximately 400-500 blades, annually) and is estimated to create employment for 100-120 factory workers. Gamesa, a wind energy company based in Spain, announced it will locate its U.S. headquarters and east coast development offices in Philadelphia and a blade manufacturing plant in Ebensburg, PA. “The

opening of the plant will create as many as 500 construction and operations jobs, including 236 permanent high-paying manufacturing positions.”²

Development of Regional Cooperatives

Under the right circumstances, cooperatives can provide a way for local communities to gain additional economic benefits from wind energy development by retaining the return on investment and energy sales profits that might otherwise go to a private developer located outside of the region. Locally-owned wind cooperatives develop wind power projects and sell the electricity to a utility. The cooperative development and ownership of wind power plants has proven successful in countries such as Denmark, where approximately two-thirds of the turbines are owned by individuals or cooperatives, but has not been practiced widely in the U. S.

Indirect economic Impacts

The construction and operation of a wind project results in the purchase of local goods and services such as construction materials and equipment, maintenance tools, supplies, and equipment and manpower essentials such as food, clothing, safety equipment, and other articles. As previously mentioned, support services such as accounting, banking, and legal assistance also are required. The rental of local equipment for maintenance is common. The Kern County Wind Energy Association, based in California, estimates that approximately \$11 million is paid annually to local businesses for goods and services as a result of wind power projects in Tehachapi, California.³ This equates to \$22,000 per MW or \$3,667 per wind turbine.

While a wind power plant can have a substantial regional economic impact, it has a minimal impact on the local and state infrastructure because of the high capital-to-labor ratio of the plant’s operation. Additional employment and property taxes add value to the local economy without creating a substantial burden on the existing water and sewer system, transportation network, or on emergency, education, and other public services.

Because businesses within a local economy are closely linked by business and personal purchasing patterns, direct benefits also have an indirect effect on the economy. The direct effects spur rounds of spending in the local and state economy, increasing the overall benefit to the area. Increased taxes from a wind power project may result in

² January 14, 2005 Press Release. Governor Rendell Announces Cambria County as Site of Gamesa’s Manufacturing Facility

³ Tehachapi, CA, is one of the three main wind development areas in the state of California. The first wind turbines in the area were installed in the mid-1980s; however, new wind projects and “re-powered” projects continue to be installed today. (Re-powering refers to the replacement of older, smaller wind turbines with newer, larger models). Wind development in Tehachapi includes approximately 500 MW of wind capacity and more than 3,000 wind turbines, ranging in size from approximately 100 kW to more than 1 MW. Tehachapi is also the location of the company headquarters and/or the central O&M facilities for several developers.

additional government spending on local, state, and federal services, or in decreased tax burdens on other property owners. Another secondary impact, referred to as the induced effect, comes from additional household earnings from employment growth that results in increased household spending on goods and services.

Additional value to local economies also results from increased diversification of the county and state economic bases. Economic diversification ensures greater stability to the economy by minimizing financial high and low cycles associated with a specific industry. This effect is particularly important in rural areas that tend to have a one-dimensional economy. Single dimension economies result in limited local business interaction; therefore, more goods and services are imported and more dollars leave the region.

Individuals can also gain indirect benefits through a municipal government that owns a wind power project. For example, a municipally-owned project located on a harbor in northern Europe uses the project revenues for harbor improvements. A number of wind projects are owned by public utilities in the U.S. and most of these enjoy strong public support.

Certain indirect economic impacts may be viewed negatively. For example, those in local recreation and eco-tourism industries may fear that siting wind turbines on a highly-visible ridgeline could negatively impact their business. Adjacent property owners may be concerned about possible devaluation of their properties due to the proximity of turbines. Although some studies have associated wind farms with enhanced tourism and increased property values, more studies will be needed before these concerns can be definitively addressed.

Economic impacts: a New York State example

The Flat Rock Windpower Project is currently under construction in Lewis County, New York. It is a two-phase project; in phase I, 120 turbines (198 MW) will be installed in 2005 and 20 turbines (32 MW) in 2006. Up to 60 additional turbines will be installed in 2006 during phase II, depending on funding and contracts. The initial 140 turbines involve leases with 61 landowners; the 60 additional turbines will require leases with another 17 landowners.

Major anticipated economic impacts of the project include:

- Up to 300 construction jobs in 2005 and 150 in 2006, with 25 permanent jobs created in operations and maintenance. Most of these jobs are expected to go to county residents.
- Approximately \$8 million in annual PILOT payments to local towns, school districts and the county, plus licensing fees and other services revenues (due in part to the project's location in an Empire Zone).
- Approximately \$1.5 million annually in landowner lease payments upon full build-out.

- Approximately \$2 million in food, lodging and other goods and services purchases by non-local labor during 2005.

Socioeconomic Impacts

Development of a wind power industry or construction of a wind power project can also have socioeconomic impacts on a region or community. These include impacts to the local culture/customs, land use, infrastructure (i.e., water, sewage, waste removal, roads, housing), emergency personnel and systems, and education. The extent of the potential impacts depends on the scope of the industry and the project(s). Wind energy projects tend to be located in rural areas, which may be more significantly impacted than urban areas.

Rural areas tend to be more culturally homogenous than urban areas. For projects or industry in rural areas, the addition of skilled labor from outside the area may put pressure on the local community due to cultural differences. Non-local workers relocating to the project area potentially bring different social attitudes, norms, and practices. In areas where the size of the development is small and limited to wind power projects, these cultural stressors are usually minimized since wind power project construction only lasts an average of six months and ongoing O&M jobs can frequently be filled by local personnel.

The amount of non-local labor will also impact short-term housing availability. For projects located in remote areas, the project developer may need to provide temporary or permanent housing. Typically, long-term housing for permanent employees is not a problem. Usually the facility manager and possibly one other staff member would be hired from outside the local community because of their expertise in operating wind power projects. All other staff positions would be filled, if possible, with skilled local labor.

As is the case for any significant construction activity, a wind power project has the potential to increase the work load for police, fire, medical, and other similar services. Although major events such as fires are rare in the construction and operation of a wind project, industrial accidents do happen and must be planned for. Typically, the construction general contractor and O&M manager will work with the local and surrounding communities to determine the ability of local services to handle potential events, and to put mitigation measures in place as necessary.

The need for construction vehicles and equipment can create impacts on local communities, with a greater effect in rural areas than in urban areas. Any road development or widening and paving would result in permanent infrastructure changes to the local community which are generally, but not always, viewed as positive. Paving a dirt road would allow for future development, and widening a road may make general travel along the road safer; however, some people living along an access road may not

want the road paved and widened, fearing a general increase in traffic and traffic speed. These concerns regarding traffic are usually addressed in a traffic study, completed as a part of the project development process, with the developer offering mitigation measures if necessary.

Wind power projects, particularly in rural areas, can also change the visual character of an area by introducing large-scale structures and machinery into previously undeveloped areas. This includes the wind turbines themselves, as well as electrical transmission equipment and construction vehicles such as cranes and service trucks.

Conclusion

In New York State, rural communities with good wind resources are being confronted with the question of whether to welcome or reject wind energy development. Often this decision-making process is highly contentious, pitting neighbor against neighbor, second homeowners against farm families, community members against elected officials. Wind development is new and not well understood in many communities, and this leads to concerns about the economic impacts.

In financially depressed areas, the prospect of wind development may be appealing, particularly to farmers who can use the revenue from land leases to augment their farming income. In some cases, this may save their farms, and save the area from other development. Neighbors, too, might prefer wind turbines, which guarantee that the majority of the surrounding land will never be developed, over the alternatives (such as a housing development, the fate of many no-longer-profitable family farms).

However, concerns surrounding wind development should not be underestimated nor dismissed as insignificant. Many people choose to live in rural areas because they enjoy the openness, remoteness and tranquility. Introducing wind turbines to these areas, which frequently also enjoy scenic resources, presents a profound change to which people are not always receptive.

Some of the controversy can be mitigated by: good communication and planning ahead (see section on the comprehensive plan); educating the community about wind resources and getting public input early on; keeping the public involved and informed in every step of the process; and working with the wind developer to get the most beneficial arrangement for the community, both in terms of financial compensation and also in details such as turbine location, spacing and setbacks.

Additional Sources of Information

Conover, K. *Planning Your First Wind Power Project, A Primer for Utilities*. Electric Power Research Institute, TR-104398. 1994.

LM Glasfibre. *LM Glasfibre Signs Contract to Supply Blades for 2,400 MW capacity for GE Energy in Canada*. Press release. March 10, 2005.

Northwest Economic Associates. *Assessing the Economic Development Impacts of Wind Power*, February 2002. Report to the National Wind Coordinating Committee. Available at www.nationalwind.org.

The Effect of Wind Energy Development on State and Local Economies, in Wind Energy Series, N.W.C. Council, Editor. 1997, NWCC.

Community Wind Financing, A Handbook by the Environmental Law & Policy Center, Charles Kubert, Howard Learner, Jill Geiger, Rebecca Stamey-White. Available at: www.elpc.org.