

# Economic Development Impacts of Colorado's First 1000 Megawatts of Wind Energy

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## Executive Summary

A confluence of events has ignited a soaring growth in the number of wind power installations in Colorado in recent years. State and federal incentives, growing environmental concerns, and economic development opportunities are among the motives that spurred wind power installations from 291 megawatts (MW) of nameplate capacity in 2006 to 1,067 MW (nameplate capacity) in 2007.

According to the *Annual Rankings Report* by the American Wind Energy Association (AWEA), Colorado is the second-fastest-growing wind energy producer in the United States (Texas is first). In terms of resource potential, Colorado currently ranks 11<sup>th</sup> out of all 50 states (AWEA, January 2008). A report of the Task Force on Renewable Resource Generation Development Areas has identified eight wind generation development areas in Colorado, with the combined potential to generate 96,000 MW or 96 gigawatts (GW) of capacity (Renewable Resource Generation Development Areas Task Force, 2007).

### Colorado Wind Power Statistics, January 2008 Source: AWEA (as of 01/16/2008)

| COLORADO                                 |          |
|------------------------------------------|----------|
| Power Capacity - Existing Projects (MW): | 1,066.75 |
| U.S. Rank (by Existing Capacity):        | 6        |
| U.S Rank (by Potential Capacity):        | 11       |

Due to the vast resource capacity and the sudden wind power development, it is pertinent to analyze the economic impact that 1,000 MW have already generated in Colorado. These impacts can be scaled to obtain a sense of the economic development opportunities associated with other new wind scenarios, including the 20% Wind Energy by 2030 scenario (U.S. Department of Energy, 2008). Furthermore, this report can be used by interested parties in other states that currently lack a Renewable Portfolio Standard (RPS) as an example of the potential economic impacts if they were to adopt 1,000 MW of wind power development. Of course, each state has unique resource constraints, characteristics, and policies. Information such as property tax values, land leases, and manufacturing bases would have to be substituted depending on local information.

According to this analysis, 1,000 MW of wind power development in the state of Colorado:

- Generates electricity to power more than 248,000 homes (11.8% of Colorado housing units in 2006<sup>1</sup>)
- Generated approximately 1,700 full-time-equivalent jobs during construction periods with a total payroll of more than \$71.3 million (2008 dollars)

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<sup>1</sup> According to the U.S. Census Bureau

- Supports approximately 300 permanent jobs in rural Colorado areas with a total annual payroll of \$14.7 million (2008 dollars)
- Generated \$226.4 million in economic activities from the construction period only (2008 dollars)
- Generates \$34.9 million in annual local economic activities (2008 dollars)
- Generates \$4.6 million in annual property taxes<sup>2</sup> (2008 dollars)
- Generates more than \$2.5 million annually in extra income for farmers and ranchers who lease their land to developers (2008 dollars).

## Introduction

Due to a growing U.S. population, an increased demand for energy, recent water shortages, migration trends from rural areas, and energy price uncertainty, it is imperative that each state takes the necessary steps toward a more secure energy future that can provide an affordable and dependable energy supply while meeting society's economic development and environmental expectations.

In taking some of the steps toward a secure energy future, Colorado has enacted state incentives and a Renewable Portfolio Standard (RPS), which foment the production of renewable sources. Currently, wind power is the fastest-growing renewable resource. In fact, large utility-scale wind projects are thought to ameliorate some of the national concerns previously mentioned because they not only bolster new jobs in the nation, but they also do so in rural communities where there is a need for job retention and diversification amid an economic slump intensified by high levels of rural migration. Wind power projects also generate tax revenues that are used to improve schools and other public services, which in turn improve the quality of life in rural areas. Local landowners also receive extra income in the form of land lease payments from wind turbines located on their land.

This report attempts to supply the reader with information on the economic benefits that 1,000 MW brings to the state of Colorado. The focus is on jobs<sup>3</sup>, land lease payments, tax revenue, payroll, and business activities that are spurred as a result of constructing and operating 1,000 MW of wind power in Colorado.

The report begins with a description of the methodology and the data used in calculating the economic impacts of 1,000 MW of wind power in Colorado. Next, it discusses and interprets results of the analysis. The report does not compare wind to other resources or

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<sup>2</sup> Because tax payments vary every year, the annual property tax calculation is based on the average annual payment over a 20-year period. See the Property Tax Revenue Impact section.

<sup>3</sup> This report did not analyze net jobs; it examined gross jobs supported by new wind development. In some cases, workers may have worked in another industry and switched to the wind industry, or they may have had a job in a wind-related industry. As long as the previous industry replaces that person, if a worker switches jobs it is still a new job supported by the wind industry. There is only a "net" loss if the previous industry doesn't replace that person.

industries, nor does it present net jobs or net economic data. It simply addresses the jobs and economic activity supported by the first 1,000 MW of utility-scale wind in Colorado. This report does not cover costs or benefits to electricity consumers. Instead, it is based on the impact specific wind projects have had on the state's economy.

## **Methodology**

### **The Jobs and Economic Development Impact (JEDI) Model**

The Jobs and Economic Development Impact (JEDI) model, developed by Marshall Goldberg for the National Renewable Energy Laboratory, calculates the number of jobs and the amount of money spent on salaries and economic activities generated in a specific location from the construction and operation of a wind power plant. The JEDI Wind Energy Model can be downloaded at <http://www.nrel.gov/analysis/jedi>.

The model relies on region-specific data pertaining to existing industries and inter-industry relations at the local level, where the output of one industry serves as input for another. Data are supplied by Minnesota Implan Group Inc. and are state-specific multipliers. Multipliers are economic indicators of the number of times a dollar circulates in an economy (Silverstein, 2006). For instance, one dollar is transferred from the hands of a wind power developer to the construction company when a construction contract is signed; the construction company uses part of that dollar to pay construction workers. Finally, construction workers use their payroll checks to purchase local goods and services such as food at local restaurants, clothing, haircuts, etc. Therefore, money spent initially by the developer ripples through the economy in a series of transactions, creating a "ripple effect."

In addition to the multipliers, the model uses construction cost data, operating cost data, and data pertaining to the percentage of goods and services acquired in the state. Jobs, payroll value, and economic activities are calculated using this information. These results are divided into two periods: construction (considered to last 1 year) and operation (recurring annual impacts for the life of the project) and are placed within the framework of the direct, indirect, and induced impacts.

#### ***Direct Impacts:***

The direct impacts are the on-site and off-site effects pertaining to the construction and operation of the wind power plant. These impacts include the number of jobs (e.g., engineers, construction workers, managers, lawyers, etc.), their corresponding payroll salaries, and economic activities (generated from purchasing materials and equipment for the road construction, wind turbine foundation, electrical collection, installation, and turbine manufacturing) supported by the initial spending of the wind farm.

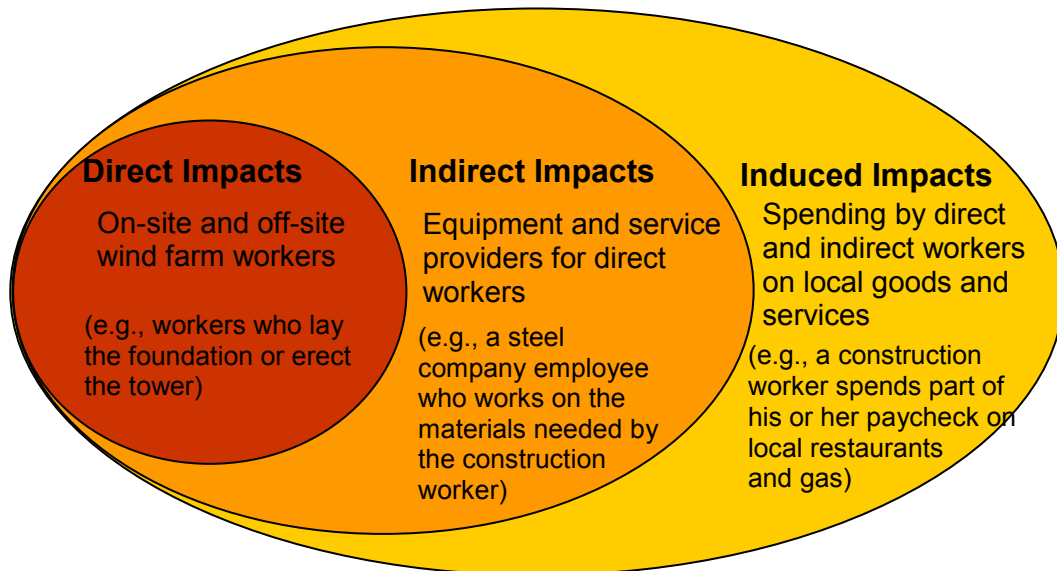
#### ***Indirect Impacts:***

The initial spending on the construction and operation of the wind farm creates a second layer of impacts. For instance, when the construction company purchases input materials, it uses the outputs of other companies. These other companies in turn pay their workers and purchase goods and services from other industries. An example of an indirect impact

is the job of a steel company employee who works on the materials needed by the wind plant construction worker. Wind power projects indirectly support these types of jobs, their corresponding salaries, and economic activities, providing the indirect impacts of the wind power project.

***Induced Impacts:***

The initial spending on the construction and operating activities along with the indirect business activities support jobs and provide payroll to employees. Employees then spend their paychecks on local goods and services, such as at restaurants and clothing stores. This is local spending induced from employees working directly or indirectly on the wind power project who were able to receive and spend their paychecks. Their consumption supports local jobs and local economic activities above and beyond what they would have purchased without the extra income from the jobs related to the wind installation. Employee spending on local goods and services is considered an induced effect.



**Figure 1: Ripple Effect as portrayed by the Jobs and Economic Development Impacts (JEDI) Model**

Although the JEDI model default data include construction cost figures, operating cost figures, and percentages of goods and services acquired in the state, project-specific data were gathered to attain more localized impact results.

**Research Data**

We obtained a list of Colorado's wind power projects from the American Wind Energy Association (AWEA) and the Global Energy Concepts (GEC) databases. The project lists contained information regarding wind project location, completion status, year online,

size, turbine manufacturer, owner, number of turbines, and turbine size. Data were collected for nine wind projects, but only Colorado's six largest projects adding up to nearly 1,000 MW of wind (998 MW to be exact) were the focus of this study.

Preliminary background research for each of the projects consisted of collecting media information and corporate press releases. This provided an indication of the construction cost and the economic impacts some of these projects generate in Colorado. Developers and others later verified the information from the media.

Extensive interviews were conducted with developers, lawyers, county commissioners, stakeholders, and other industry experts. Data gathered from interviews included construction cost, operation and maintenance cost, percentage of goods and services acquired in-state, job generation during the construction period, job generation during the operating period, land lease payments, tax information, payroll parameters, and cost breakdown of different categories based on project cost percentages.

It is important to note, however, that because JEDI model inputs consist of detailed information considered proprietary, the amount and quality of the information obtained varied from project to project. Thus in some instances, we used anecdotal information, data extrapolation, and literature reviews.

The JEDI model was used to calculate economic impacts of each of Colorado's six largest wind power projects. Appropriate adjustments to the model (cost information, local share values, and job creation numbers) were made to mirror verified data obtained from interviews. Individual economic impacts were then aggregated to reflect combined impacts from 1,000 MW.

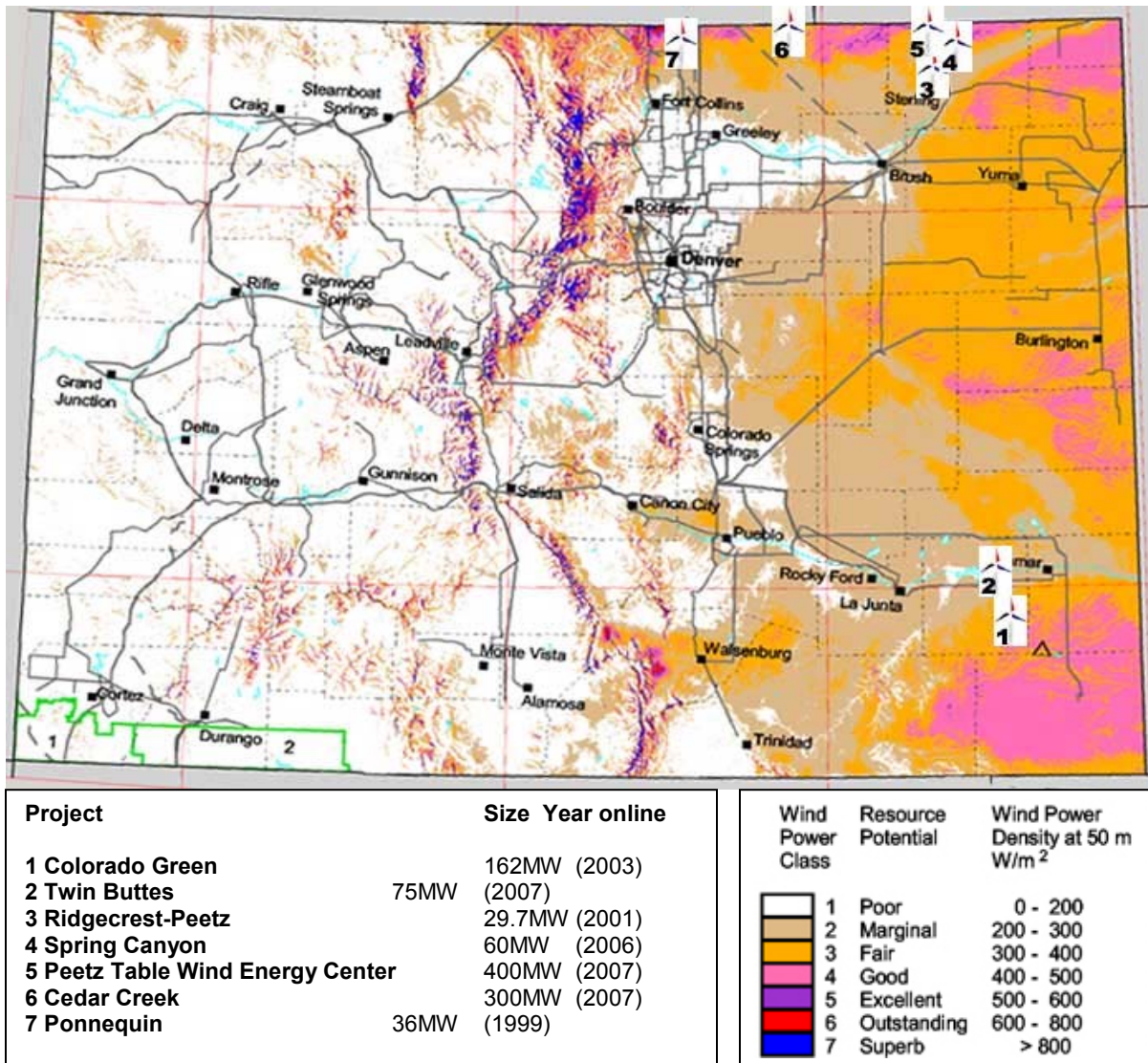
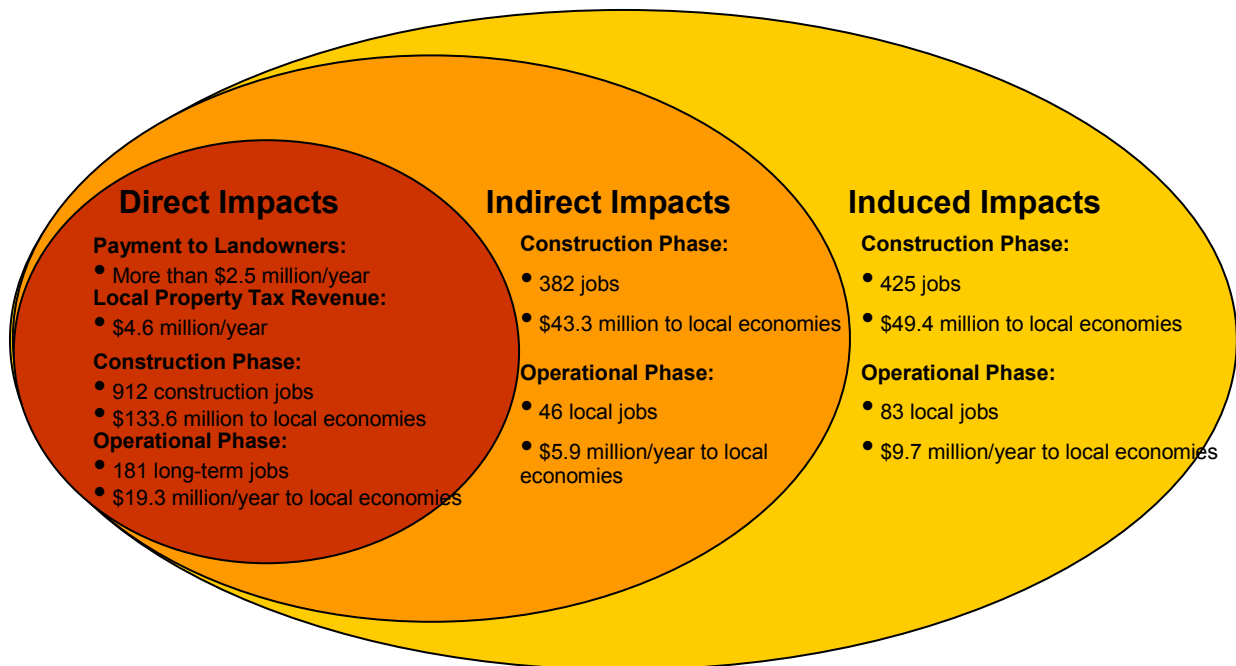


Figure 2: Colorado Wind Project Locations

## Results

The study results show significant economic impacts from 1,000 MW of wind energy development. We show the impacts on employment, property tax, landowner revenue, and local economic activities during the construction and operational periods.



**Figure 3: Economic Ripple Effect from 1,000 MW of Wind Energy Development in Colorado**

### Employment Impacts

Most of the direct jobs related to the construction and operation of wind power plants require skilled professionals in the fields of engineering, construction, management, and manufacturing. These are well-paid positions that boost economic development in rural communities where new employment opportunities are welcome due to economic downturns.

This analysis showed that most positions related to the construction and operation of wind power plants in Colorado currently offer salaries ranging from \$29,000 to \$90,000. These are competitive payroll earnings, especially in areas such as Bent County (home to one of the wind power projects in this study), where more than 20% of the population is considered to live below poverty levels<sup>4</sup>.

### Construction Jobs

A typical wind farm construction period lasts between 6 to 12 months. During that period, a number of construction workers, engineers, administrative employees, and managers move to town, boosting local economic activities. Locally employed workers may work directly on the new wind project, depending on the skill set in the area. According to our interviews with developers, certain contracts require that a percentage of workers be hired from the area where the wind power project is developed. For the six wind farms analyzed, 75% to 85% of construction workers were Colorado residents. Certain positions related to electrical collection system and management require labor

<sup>4</sup> According to the U.S. Census Bureau (2004 data). State and County Quickfacts: Bent County, CO

outsourcing from other states such as California and Wyoming, or even from other countries, such as Denmark.

*This research suggests that 1,000 MW of wind power development supports approximately 1,700 full-time-equivalent jobs in Colorado rural areas with a total payroll of more than \$70 million during the construction phase of new wind projects.*

### **Operation and Maintenance Jobs**

When the wind farm goes online, it needs permanent employees to operate and maintain the facility during its 20- to 30-year expected life. These permanent positions are also well-paid positions, the majority of which are filled by Coloradoans or by people who relocate to Colorado.

In counties such as Bent, where the population is estimated at 5,551 inhabitants<sup>5</sup> (2006) and population declined by 7.5% between 2000 to 2006<sup>6</sup>, the number of permanent jobs generated by the wind industry sector contributes significantly to combat depopulation trends.

*This research shows that 1,000 MW of wind energy capacity in the state of Colorado supports approximately 300 permanent jobs in Colorado rural areas with a total annual payroll of more than \$14 million.*

Although most operation and maintenance jobs are 100% local, at least one developer alleged to outsource some of the wind project's routine maintenance operations from out-of-state by bringing in a technician to Colorado twice a year.

### **Property Tax Revenue Impacts**

Wind energy projects also increase the property tax revenue base in local counties, which in turn is used to improve local schools, parks, recreational facilities, community programs, fire departments, and other public services in rural communities.

*So far, Colorado's six largest projects have generated approximately \$23.8 million in property taxes (2008 dollar value) from the time these projects came online. In 2008 alone, these projects generated approximately \$9.6 million in property tax revenue.*

In Colorado, property taxes vary dramatically from year to year, and the highest burden of taxation is borne during the first years of project operation (especially for projects that went online prior to 2006, which are not subject to the new taxation procedure). Using the average annual tax payments over the life of the wind farm project (assumed to be 20 years) offers a more accurate picture of the potential annual impacts in Colorado.

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<sup>5</sup> U.S. Census Bureau

<sup>6</sup> U.S. Census Bureau

*This research shows that across Colorado, the average annual tax payment over a 20-year expected project life period is \$4,800 per MW per year (in current 2008 dollar value)<sup>7</sup>. Colorado's six largest projects alone generate \$4.6 million in average annual property taxes (in 2008 dollars)<sup>8</sup>.*

In certain counties, an increased tax base may not always increase the funds allocated to public services such as the local school district. If that is the case, then the tax generated from the wind power project may lower the local mil levy, which can result in substantial savings for taxpayers in the district where the wind farm is located.

## **Landowner Revenue Impacts**

Land leases provide a stable source of income for farmers and ranchers who lease their land to wind developers. Most of the land leases in Colorado are negotiated as a percentage of revenue (royalty) based on power purchase agreements (PPAs). There are different types of payment schemes, but according to this research, most of the land lease payments in Colorado are paid at 2.5% - 3.5% of revenue, which escalates annually, potentially reaching up to 6% by the 25<sup>th</sup> year the project is in operation.

Although wind power projects occupy several acres of land, the actual footprint of the wind turbine is small, allowing farmers to continue to grow their crops or graze their cattle even though turbines are on the land. Furthermore, there are other economic opportunities for landowners in the form of road access payments (land easements), and land lease revenues for O&M buildings and substations. These could be one-time payments or annual payments that could represent \$2,000 per year or as much as \$200 per acre per year.

*This research suggests that across Colorado, land lease revenue is on average \$2,400 per MW per year, which is between \$1,800-\$4,800 per turbine. Colorado's six largest projects (totaling 1,000 MW) generate more than \$2.5 million annually in extra income for farmers and ranchers who lease their land to developers.*

Some projects in Colorado are sited on land owned by the government. In these cases, land lease revenue is used to improve public services. A report by the U.S. Government Accountability Office found that Colorado received \$40,763 in 2003 from the lease of 942 acres of land, where 23 of the 44 turbines belonging to the Ponnequin wind power plant are located.

## **Economic Activities Impacts**

As previously mentioned, the construction and operation of a wind power plant is the catalyst for several economic activities in Colorado. From the houses that are rented in town to host the influx of construction workers, to the suppliers and transportation

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<sup>7</sup> \$5,676 in nominal dollars

<sup>8</sup> \$5.3 million in nominal dollars

companies that provide services to the wind farm, wind power development generates a benefit to the state economy.<sup>9</sup>

*This research found that 1,000 MW of wind power developed in Colorado generated approximately \$225 million in economic activities (\$133.6 million in direct economic activities) during the construction phase and approximately \$35 million in annual recurring local economic activities (of which \$19.3 million relate to direct economic activities).*

### **Other Impacts**

New wind power installations offer other benefits, such as use tax generation, sales tax generation, transmission line impacts, water savings, price stability, and environmental benefits. Despite their importance, this report does not focus on these additional outcomes.

## **Manufacturing Potential**

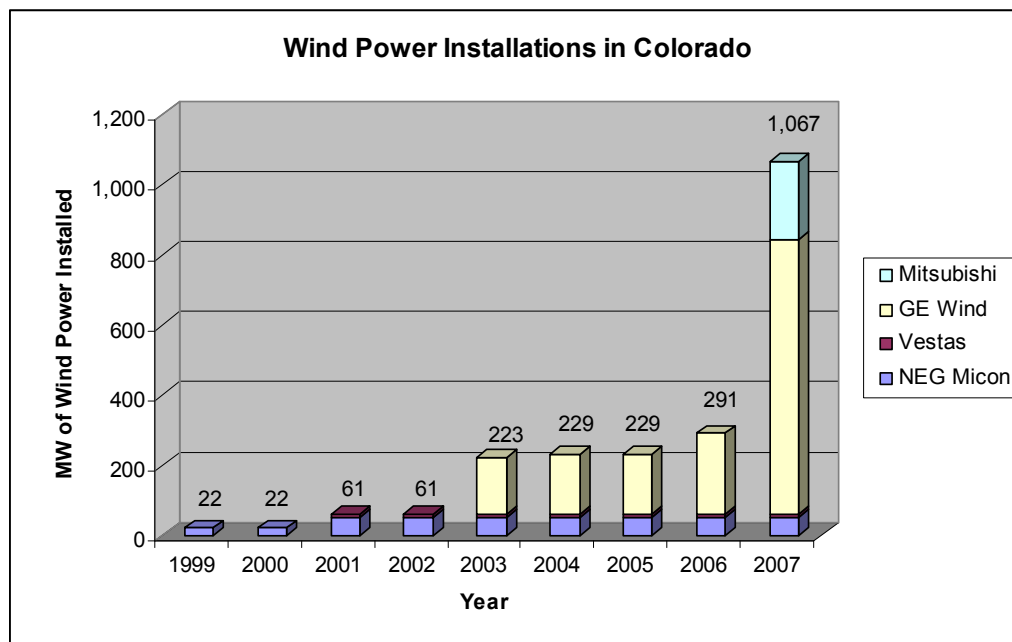
Although Colorado did not benefit from wind-related manufacturing jobs until recently, it is pertinent to analyze the potential economic impacts associated with local wind component manufacturing, especially now that Colorado is experiencing growth in this sector.

Based on the number of megawatts installed, manufacturing company General Electric has the greatest market share in Colorado (73.5%), followed by Mitsubishi (20.7%), NEG Micon (5%), and Vestas (0.9%). However, none of these companies manufactured turbines in Colorado until March 2008, when Vestas opened a blade facility in Windsor. Therefore, any jobs related to turbine manufacturing represent economic leakages for the first 1,000 MW in Colorado. In all cases, the economic benefit from manufacturing went to foreign countries such as India, China, Denmark, Germany and Brazil, or states other than Colorado. This may not be the case in the future because blades are currently being manufactured in the state. Vestas has announced it will expand its manufacturing facilities in Colorado in the coming years.<sup>10</sup>

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<sup>9</sup> This report did not analyze net jobs; it examined gross jobs supported by new wind development. In some cases, workers may have worked in another industry and switched to the wind industry, or they may have had a job in a wind-related industry. As long as the previous industry replaces that person, if a worker switches jobs it is still a new job supported by the wind industry. There is only a “net” loss if the previous industry doesn’t replace that person.

<sup>10</sup> Vestas announcement, 2008

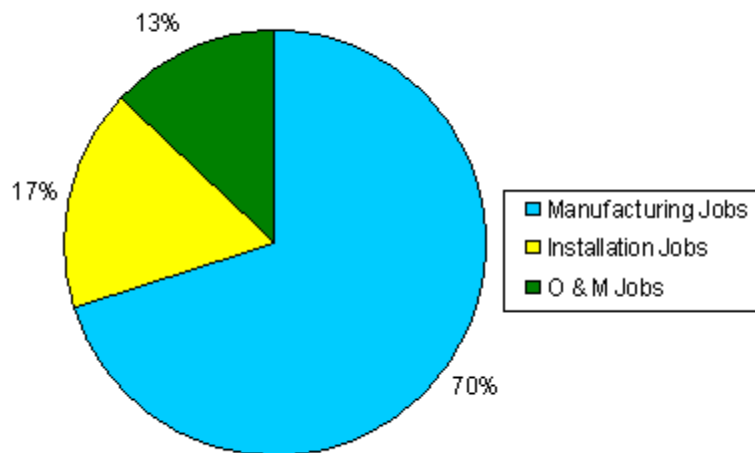


**Figure 4. Colorado Wind Power Installation**

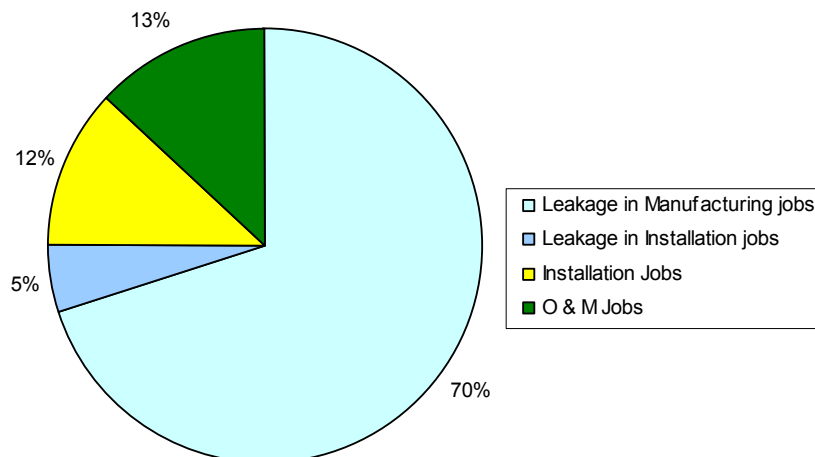
**Source: AWEA (as of 01/16/2008)**

According to a Renewable Energy Policy Project (REPP) study, approximately 70% of potential job creation is attributed to manufacturing jobs, 17% is attributed to the installation of the turbines, and 13% is attributed to operation and maintenance jobs (Sterzinger and Svrcek, 2004).

Under this scenario, because there were no manufacturing facilities in Colorado until the beginning of 2008, that would represent a leakage of 70% in potential job generation. In addition, since this research suggests that 75% of the installation jobs are local (a leakage of 25%), it can be implied that Colorado realizes approximately 25% of the potential job creation from wind power development (see figures below).



**Figure 5: Potential manufacturing, installation, and O&M jobs as a percentage of total job generation (according to REPP studies)**



**Figure 6: Real job creation (in yellow and green) in Colorado, as a percentage of potential job creation from a wind power plant**

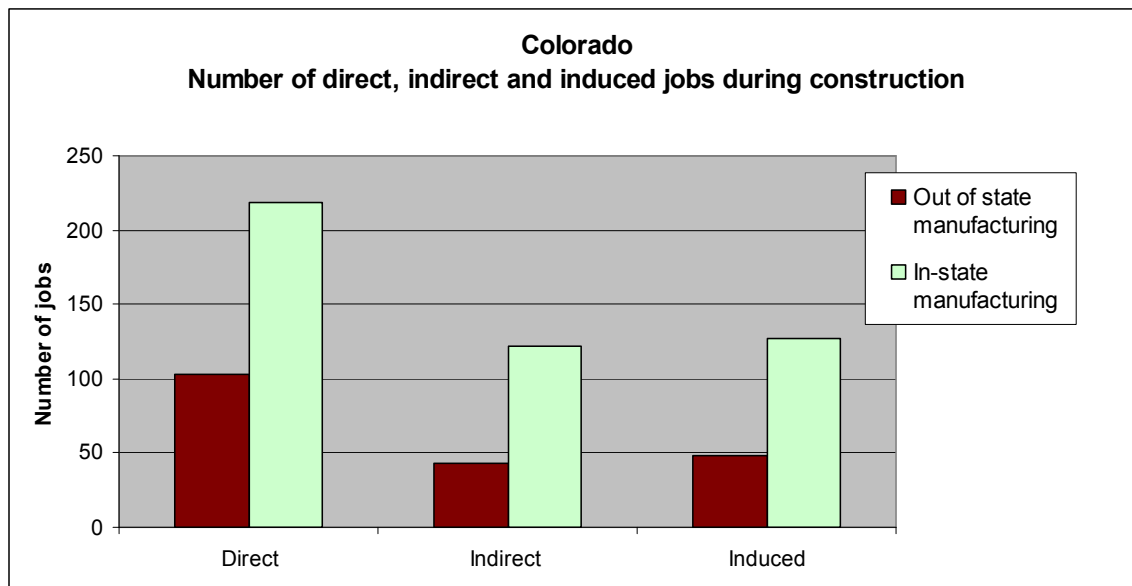
In March 2008, Vestas (a Denmark-based turbine manufacturing company) opened a blade facility in Windsor, Colorado due in part to the state's commitment to renewable energy and its transportation infrastructure. This is one example of how wind power is expanding businesses and attracting companies to relocate to Colorado.

The Vestas facility in Windsor is expected to produce 1,800 blades per year (when the plant is entirely operational in the summer of 2009), which will create approximately 700 jobs for Coloradoans (Peif, 2008) with salaries ranging from \$45,000-\$60,000 (Rebchook and Fillion, 2007). Having a local manufacturing company also benefits in-state businesses that provide goods and services to the manufacturing facility, thus boosting economic activities.

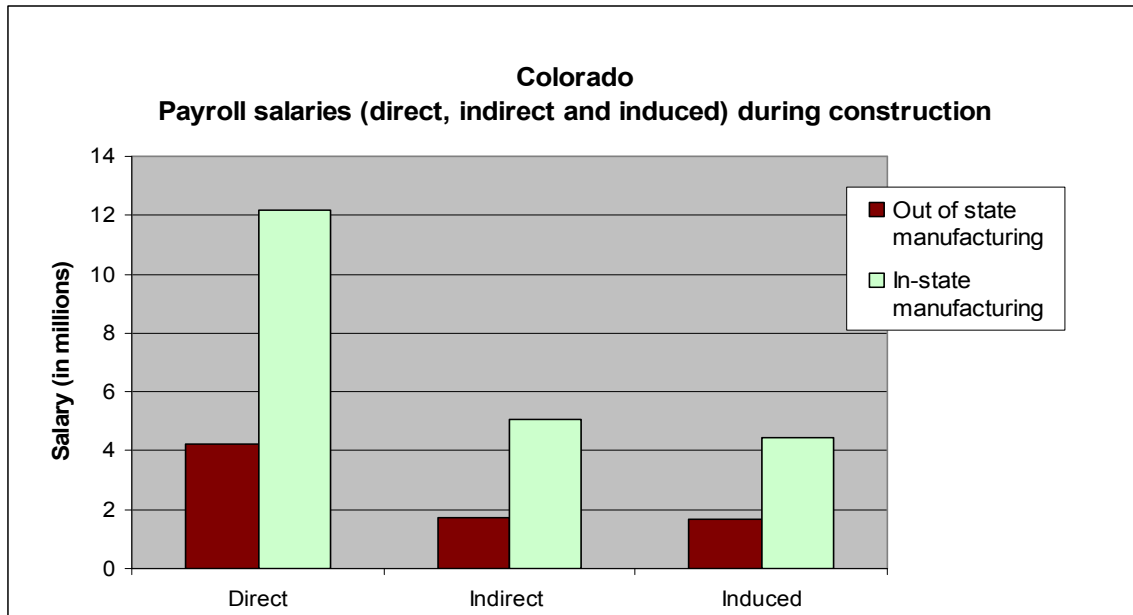


**Figure 7. Groundbreaking of the new Vestas facility in Windsor**

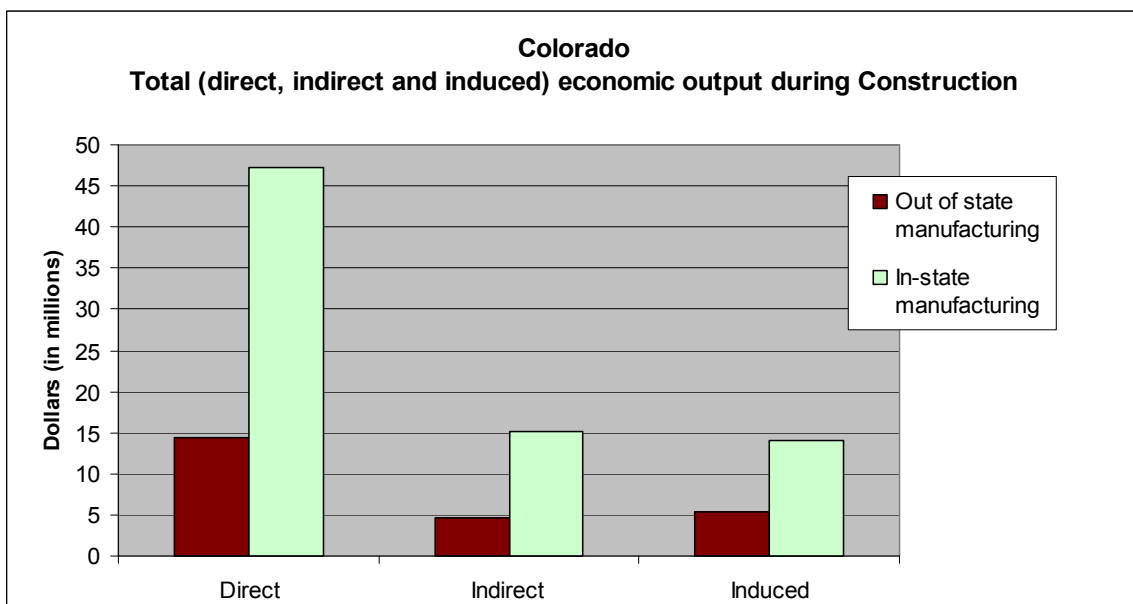
The following graphs compare the impacts of two hypothetical scenarios in which a 100-MW wind farm is built using local blades vs. a scenario in which the blades are from out of state.



**Figure 8: Job creation from 100 MW of wind power in Colorado: In-state blade manufacturing vs. out-of-state blade manufacturing**



**Figure 9: Payroll creation from 100 MW of wind power in Colorado: In-state blade manufacturing vs. out-of-state blade manufacturing**



**Figure 10: Economic activities from 100 MW of wind power in Colorado: In-state manufacturing vs. out-of-state manufacturing**

Based on the graphs above, it is obvious that states with manufacturing facilities will experience the largest increase in job numbers compared to those states without manufacturing facilities.

## Concluding Remarks

This analysis showed that 1,000 MW of wind energy benefits Colorado — and particularly rural communities in the state — by supporting jobs, generating tax revenue, generating land lease revenue, and stimulating economic activities.

The new Vestas blade facility is one example of how wind power has contributed to a healthier and more diversified business climate in the state as it has marked the beginning of an emerging manufacturing industry in Colorado. Two other manufacturing companies plan to open factories in Colorado in the near future. Dragon Wind, a Texas-based manufacturing company, seeks to open a steel tower facility in Lamar (Raabe, 2008), and Woodward Governor is planning to produce turbine inverters in Fort Collins or Loveland (Beahm, 2008). These two facilities will add 200 manufacturing jobs to Colorado (Beahm, 2008).

Recognizing the value of local ownership as a driver for economic development is paramount for the enactment of sound state and federal policies that can expand the wind industry sector. The wind industry is now facing obstacles related to the uncertainty about the Production Tax Credit (PTC), rising commodity prices, the weakness of the dollar, transmission access and capacity, and shortage of turbine supply. Overcoming some of these obstacles is critical for enhancing Colorado's energy portfolio. The results from Colorado's 1,000 MW of wind energy attest to Colorado's potential in meeting society's economic development expectations while providing a more secure energy future.

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## Appendices

### Appendix A: Model Assumptions

We used the following assumptions to calculate the report's results:

- The capacity factor for each of the wind projects is assumed to be 35% for the purpose of tax calculation (see Appendix B) and land lease payments. This percentage is consistent with information provided by developers and literature review (Wiser and Bolinger, 2006).
- Mill levies used pertain to 2007 and are based on the county where the wind farm is located. Even though mill levies will vary every year to reflect budget necessities, they are assumed to remain constant over time for the purpose of this analysis:

| County  | Mill Levy Used |
|---------|----------------|
| Bent    | 70             |
| Logan   | 70             |
| Prowers | 65             |
| Weld    | 60             |

**Figure 11: Mill levies used for tax calculations**

- The life of a wind farm is assumed to be 20 years for the purpose of calculating average annual tax payments.
- The Net Present Value (NPV) of property tax revenue generated over a 20-year period was calculated assuming a discount rate of 3%.
- These calculations also assume that entities financing the wind power projects are located out of state, and therefore Colorado does not benefit from these economic activities.

### Appendix B: Tax Calculations

Bill HB 1275 changed the way wind farms are taxed in Colorado. Prior to this bill, wind farms were taxed based on project cost (cost approach). After passing this bill, wind farms operating on or after January 1, 2006 are taxed based on energy sales (income approach).

Cost Approach: According to the Colorado Department of Local Affairs, Division of Property Taxation, “wind farms in operation prior to January 1, 2006 are valued under the cost approach utilizing a replacement cost threshold based on the cost to construct a comparable non-renewable resource facility” (Colorado Department of Local Affairs, Division of Property Taxation, 2007). The replacement cost threshold is described below:

| 2007 Assessment Cost Threshold |             |
|--------------------------------|-------------|
| Facility Size per kW           | Factor Used |
| Up to 100,000                  | \$627/kW    |
| 100,000-250,000                | \$533/kW    |

Figure 12: 2007 Assessment Cost Threshold

The example below illustrates the tax revenue generated from a hypothetical 100-MW wind power plant that came online prior to January 1, 2006. For this hypothetical scenario, it is assumed that the capacity factor of the wind farm is 35%, the energy price is \$45/MWh, and the county mill levy is 65.

|                                        |                |
|----------------------------------------|----------------|
| Capacity Factor                        | 35.00%         |
| Plant Capacity                         | 100.00 MW      |
| Energy Price                           | 45.00 \$/MWH   |
| Capital Cost Threshold                 | 627 \$/KW      |
| Total Capital Cost Threshold in \$     | \$ 62,700,000  |
| Decimal Mill Levy of Facility Location | 0.065000       |
| Inflation Assumption                   | 3.00% per year |

Figure 13: Assumptions used in calculating property tax revenue generated from a 100-MW wind farm in Colorado under the cost approach

Property tax revenue generated can be calculated as:

|                                            | Comparable Cost Basis | Depreciation Factor | Depreciated Value | Assessment Rate | Projected Assessed Value | Prev Year's Mill Levy % | Projected Property Tax |
|--------------------------------------------|-----------------------|---------------------|-------------------|-----------------|--------------------------|-------------------------|------------------------|
| Year 1                                     | \$ 62,700,000         | 95.00%              | \$ 59,565,000     | 29.00%          | \$ 17,273,850            | 6.5000%                 | \$ 1,122,800           |
| Year 2                                     | \$ 62,700,000         | 90.00%              | \$ 56,430,000     | 29.00%          | \$ 16,364,700            | 6.5000%                 | \$ 1,063,706           |
| Year 3                                     | \$ 62,700,000         | 85.00%              | \$ 53,295,000     | 29.00%          | \$ 15,455,550            | 6.5000%                 | \$ 1,004,611           |
| Year 4                                     | \$ 62,700,000         | 80.00%              | \$ 50,160,000     | 29.00%          | \$ 14,546,400            | 6.5000%                 | \$ 945,516             |
| Year 5                                     | \$ 62,700,000         | 75.00%              | \$ 47,025,000     | 29.00%          | \$ 13,637,250            | 6.5000%                 | \$ 886,421             |
| Year 6                                     | \$ 62,700,000         | 70.00%              | \$ 43,890,000     | 29.00%          | \$ 12,728,100            | 6.5000%                 | \$ 827,327             |
| Year 7                                     | \$ 62,700,000         | 65.00%              | \$ 40,755,000     | 29.00%          | \$ 11,818,950            | 6.5000%                 | \$ 768,232             |
| Year 8                                     | \$ 62,700,000         | 60.00%              | \$ 37,620,000     | 29.00%          | \$ 10,909,800            | 6.5000%                 | \$ 709,137             |
| Year 9                                     | \$ 62,700,000         | 55.00%              | \$ 34,485,000     | 29.00%          | \$ 10,000,650            | 6.5000%                 | \$ 650,042             |
| Year 10                                    | \$ 62,700,000         | 50.00%              | \$ 31,350,000     | 29.00%          | \$ 9,091,500             | 6.5000%                 | \$ 590,948             |
| Year 11                                    | \$ 62,700,000         | 45.00%              | \$ 28,215,000     | 29.00%          | \$ 8,182,350             | 6.5000%                 | \$ 531,853             |
| Year 12                                    | \$ 62,700,000         | 40.00%              | \$ 25,080,000     | 29.00%          | \$ 7,273,200             | 6.5000%                 | \$ 472,758             |
| Year 13                                    | \$ 62,700,000         | 35.00%              | \$ 21,945,000     | 29.00%          | \$ 6,364,050             | 6.5000%                 | \$ 413,663             |
| Year 14                                    | \$ 62,700,000         | 30.00%              | \$ 18,810,000     | 29.00%          | \$ 5,454,900             | 6.5000%                 | \$ 354,569             |
| Year 15                                    | \$ 62,700,000         | 25.00%              | \$ 15,675,000     | 29.00%          | \$ 4,545,750             | 6.5000%                 | \$ 295,474             |
| Year 16                                    | \$ 62,700,000         | 20.00%              | \$ 12,540,000     | 29.00%          | \$ 3,636,600             | 6.5000%                 | \$ 236,379             |
| Year 17                                    | \$ 62,700,000         | 20.00%              | \$ 12,540,000     | 29.00%          | \$ 3,636,600             | 6.5000%                 | \$ 236,379             |
| Year 18                                    | \$ 62,700,000         | 20.00%              | \$ 12,540,000     | 29.00%          | \$ 3,636,600             | 6.5000%                 | \$ 236,379             |
| Year 19                                    | \$ 62,700,000         | 20.00%              | \$ 12,540,000     | 29.00%          | \$ 3,636,600             | 6.5000%                 | \$ 236,379             |
| Year 20                                    | \$ 62,700,000         | 20.00%              | \$ 12,540,000     | 29.00%          | \$ 3,636,600             | 6.5000%                 | \$ 236,379             |
| 20 YEAR PROPERTY TAX REVENUE (cost method) |                       |                     |                   |                 |                          |                         | \$ 11,818,950          |

Figure 14: Tax revenue generated from a 100-MW wind power plant under the cost approach

Because dollars in future years do not have the same values as dollars today, the Net Present Value (NPV) of the tax revenue stream is then calculated. This study used a discount rate of 3%.

Income approach: According to the Colorado Department of Local Affairs, the cost approach was “neither uniform nor just and equal because of wide variations in the production from wind turbines because of the uncertainty of wind available for energy reduction and because the cost of constructing a wind energy facility is significantly more expensive than any other utility production facility” (Colorado Department of Local Affairs, Division of Property Taxation, 2007). Therefore, Bill 1275 was enacted in June 2007 to allow a new form of taxation for wind farms that went online after January 1, 2006.

According to this new income approach method, the gross revenue from a wind project is calculated using the capacity factor of the wind farm, the energy price as determined by the PPA, and the size of the wind facility. Then, a projected 20-year tax revenue stream is calculated. A “trial and error multiplier” factor is then determined so that when it is applied to the projected gross revenue, the result will equal or at least be very close to the 20-year estimate under the cost approach.

|                                                     | Annual Energy | Energy Price | Energy Revenue | Trial & Error Multiplier | Adjusted Revenue | Assessment Rate | Assessed Value | Prev Year's Mill | Projected Property Tax |
|-----------------------------------------------------|---------------|--------------|----------------|--------------------------|------------------|-----------------|----------------|------------------|------------------------|
| Year 1                                              | 306,600       | \$ 45.00     | \$ 13,797,000  | 1.69                     | \$ 23,330,589    | 29.00%          | \$ 6,765,871   | 6.5000%          | \$ 439,782             |
| Year 2                                              | 306,600       | \$ 46.35     | \$ 14,210,910  | 1.69                     | \$ 24,030,507    | 29.00%          | \$ 6,968,847   | 6.5000%          | \$ 452,975             |
| Year 3                                              | 306,600       | \$ 47.74     | \$ 14,637,237  | 1.69                     | \$ 24,751,422    | 29.00%          | \$ 7,177,912   | 6.5000%          | \$ 466,564             |
| Year 4                                              | 306,600       | \$ 49.17     | \$ 15,076,354  | 1.69                     | \$ 25,493,965    | 29.00%          | \$ 7,393,250   | 6.5000%          | \$ 480,561             |
| Year 5                                              | 306,600       | \$ 50.65     | \$ 15,528,645  | 1.69                     | \$ 26,258,783    | 29.00%          | \$ 7,615,047   | 6.5000%          | \$ 494,978             |
| Year 6                                              | 306,600       | \$ 52.17     | \$ 15,994,504  | 1.69                     | \$ 27,046,547    | 29.00%          | \$ 7,843,499   | 6.5000%          | \$ 509,827             |
| Year 7                                              | 306,600       | \$ 53.73     | \$ 16,474,340  | 1.69                     | \$ 27,857,943    | 29.00%          | \$ 8,078,804   | 6.5000%          | \$ 525,122             |
| Year 8                                              | 306,600       | \$ 55.34     | \$ 16,968,570  | 1.69                     | \$ 28,693,682    | 29.00%          | \$ 8,321,168   | 6.5000%          | \$ 540,876             |
| Year 9                                              | 306,600       | \$ 57.00     | \$ 17,477,627  | 1.69                     | \$ 29,554,492    | 29.00%          | \$ 8,570,803   | 6.5000%          | \$ 557,102             |
| Year 10                                             | 306,600       | \$ 58.71     | \$ 18,001,956  | 1.69                     | \$ 30,441,127    | 29.00%          | \$ 8,827,927   | 6.5000%          | \$ 573,815             |
| Year 11                                             | 306,600       | \$ 60.48     | \$ 18,542,014  | 1.69                     | \$ 31,354,361    | 29.00%          | \$ 9,092,765   | 6.5000%          | \$ 591,030             |
| Year 12                                             | 306,600       | \$ 62.29     | \$ 19,098,275  | 1.69                     | \$ 32,294,992    | 29.00%          | \$ 9,365,548   | 6.5000%          | \$ 608,761             |
| Year 13                                             | 306,600       | \$ 64.16     | \$ 19,671,223  | 1.69                     | \$ 33,263,841    | 29.00%          | \$ 9,646,514   | 6.5000%          | \$ 627,023             |
| Year 14                                             | 306,600       | \$ 66.08     | \$ 20,261,360  | 1.69                     | \$ 34,261,757    | 29.00%          | \$ 9,935,909   | 6.5000%          | \$ 645,834             |
| Year 15                                             | 306,600       | \$ 68.07     | \$ 20,869,200  | 1.69                     | \$ 35,289,609    | 29.00%          | \$ 10,233,987  | 6.5000%          | \$ 665,209             |
| Year 16                                             | 306,600       | \$ 70.11     | \$ 21,495,276  | 1.69                     | \$ 36,348,298    | 29.00%          | \$ 10,541,006  | 6.5000%          | \$ 685,165             |
| Year 17                                             | 306,600       | \$ 72.21     | \$ 22,140,135  | 1.69                     | \$ 37,438,746    | 29.00%          | \$ 10,857,236  | 6.5000%          | \$ 705,720             |
| Year 18                                             | 306,600       | \$ 74.38     | \$ 22,804,339  | 1.69                     | \$ 38,561,909    | 29.00%          | \$ 11,182,954  | 6.5000%          | \$ 726,892             |
| Year 19                                             | 306,600       | \$ 76.61     | \$ 23,488,469  | 1.69                     | \$ 39,718,766    | 29.00%          | \$ 11,518,442  | 6.5000%          | \$ 748,699             |
| Year 20                                             | 306,600       | \$ 78.91     | \$ 24,193,123  | 1.69                     | \$ 40,910,329    | 29.00%          | \$ 11,863,995  | 6.5000%          | \$ 771,160             |
| <b>20 YEAR PROPERTY TAX REVENUE (income method)</b> |               |              |                |                          |                  |                 |                |                  | <b>\$ 11,817,096</b>   |

**Figure 15: Tax revenue generated from a 100-MW wind power plant under the income approach**

The “trial and error multiplier” factor is then applied to the actual gross revenue reported by the wind farm on its annual statement; this is how property tax revenue is calculated.

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