# Memorandum

**To:** Ed Cherian

**CC:** Matt Magnusson

**From:** Ross Gittell

**Date:** 3/5/2010

**Re:** Groton Wind LLC Economic Analysis

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Based on your communication to us that the final engineering for the Groton Wind Farm has been completed and the decision has been made to reduce the overall project by 1 turbine, to a total of 24 turbines (48 MW) rather than 25, we are submitting this memorandum to state the impact that this change would have on our economic analysis report "Economic Impact of the Proposed Groton Wind 50 MW Wind Power Project in Groton, New Hampshire" released in January 2010. The original analysis was based on capital expenditures information provided by Groton Wind LLC for 25 turbines.

The economic impact analysis and findings do not change significantly with the changes with the final engineering of the Groton Wind project reducing the number of turbines from 25 to 24. Our estimation is that the overall local economic impact would be decreased by 5 percent or less. This is well within the normal expected margin of error with forecasts of economic impact of projects such as Groton Wind Farm.

# Economic Impact of the Proposed Groton Wind 50 MW Wind Power Project in Groton, New Hampshire

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# Contents

1 Executive Summary ..... 3
2 Introduction ..... 5
2.1 Overview ..... 5
2.2 Wind Energy and the Economy ..... 6
2.2.1 U.S. & New England Wind Energy Industry ..... 6
2.2.2 Wind Power Economic Impacts ..... 8
3 Methodology & Assumptions ..... 10
4 Analysis ..... 15
4.1 Local Area Economic Impact ..... 15
4.2 Direct Wind Construction Employment Potential in Local Region ..... 17
4.3 Fiscal Impact on the Town of Groton ..... 18
4.4 Economic Costs ..... 18
5 Conclusion ..... 19
6 References ..... 20
7 Research Team ..... 21

# 1 Executive Summary

Groton Wind, LLC is proposing a 50 Megawatt (MW) wind power project ("Project") on private land located in Groton, New Hampshire. The current project schedule is for construction to commence in November 2010 with commercial operation to start in 2011. The project has an anticipated budget of up to $140 million, dependent upon market prices for turbines and other materials and services.

The U.S. wind energy industry is growing at a significant rate, with business investment totaling $17 billion in 2008. New England has lagged the nation in attracting wind power investment even though it has significant potential for wind. However, New Hampshire and Maine are beginning to stand out in New England with significant recent additions of wind power generation. New Hampshire had 24 MWs of wind power installed in 2008 (the Lempster Wind Farm) and has an additional 99 MWs of wind power permitted for development in Coos County. Maine has 104 MWs of wind power installed—with 95 MWs installed since 2007—and 157.5 MWs of additional wind power under development.

The economic benefits for Grafton County and the surrounding area of northern and central New Hampshire ("local area economy") from the Project are expected to be significant. The Project's development activities have already begun to bring investment into the local area economy. To date, Groton Wind, LLC has spent over $1.2 million on development activities with over 60% being spent in New Hampshire on services including civil engineering, surveying, legal, environmental studies, and permitting.

**Table 1: Groton Wind Power Project Summary Statistics**

| | |
|---|---|
| Total Investment (millions) | $140 |
| Size (MW) | 50 |
| Total Economic Benefits -20 Year Period (millions) | $79.6 |
| Total Economic Benefits – 20 Year Period – per MW (millions) | $1.6 |

The construction phase of the Project is the time period when there will be the greatest economic activity and benefits for Grafton County and the surrounding local area. While direct employment opportunities from wind construction are predominantly in manufacturing and construction, the turbines will be manufactured in Pennsylvania and therefore construction—not manufacturing—will be the major source of direct local area employment impact.

The Project is expected to contribute $24.5 million during construction to the local area (Grafton, Belknap, Carroll, Coos, Merrimack, and Sullivan counties) economy. This represents about 1% of northern and central NH economic activity. In the operation

phase—after the construction phase—the economic and jobs impact of the Project are less but still significant. The Project is expected to contribute $2.9 million annually to the local area economy. Total benefits (including direct, indirect and induced) to the local economy from the Project are expected to be $79.6 million or $1.6 million per MW over a 20-year period.

**Table 2: Groton Wind Power Project Construction Phase Impacts**

| | |
|---|---|
| **Total Local Area Economic Activity (millions)** | $24.5 |
| Direct Local Area Economic Activity (millions) | $5.2 |
| Indirect Local Area Economic Activity (millions) | $14.1 |
| Induced Local Area Economic Activity (millions) | $5.2 |
| **Total Local Area Jobs** | 229 |
| Direct Local Area Jobs | 72 |
| Indirect Local Area Jobs | 107 |
| Induced Local Area Jobs | 50 |

During the construction phase, the Project is expected to create a total 339 full-time equivalent (FTE) jobs. This employment figure includes jobs filled both by local and non-local labor and consists of construction employment and indirect and induced employment from project wages and local project expenditures (the so-called multiplier effect).

Of these 339 jobs, there will be a total 135 FTE construction jobs directly involved in construction with more than half of the construction jobs (72 FTE) expected to be filled by NH resident workers. The Project in its on-going operations phase is expected to create an estimated 6 jobs for workers employed by Groton Wind and create an additional 14 jobs in the local economy through the expenditures of the Project including: employee salaries, local supplies and services, land owner payments and local tax payments.

**Table 3: Groton Wind Power Project On-Going Operations Impacts**

| | |
|---|---|
| **Total Local Area Economic Activity (millions)** | $2.9 |
| Direct Local Area Economic Activity (millions) | $1.1 |
| Indirect Local Area Economic Activity (millions) | $1.3 |
| Induced Local Area Economic Activity (millions) | $0.5 |
| **Total Local Area Jobs** | 20 |
| Direct Local Area Jobs | 6 |
| Indirect Local Area Jobs | 5 |
| Induced Local Area Jobs | 9 |

Many of the new jobs created by the Project can be termed “Green Jobs”. Green jobs are jobs that involve, develop, or employ environmentally friendly practices or technologies; this includes the renewable energy sector. These type of jobs tend to be high quality and well-paid. The jobs involved in the construction of the Project are expected to pay $46,200 in annual wages, 23% higher than the local area average annual wage of $37,700.

# 2 Introduction

## 2.1 Overview

Groton Wind, LLC is proposing a 50 Megawatt (MW) wind power project in Groton (Grafton County), New Hampshire. The Project will consist of twenty-five 2.0 MW wind turbines situated along mountain ridgelines in Groton. The current project work schedule is for construction to begin in November 2010 and last approximately 11 months. The Project is expected to involve a total investment of up to $140 million.[1]

Iberdrola Renewables, Inc. (IBR), Groton Wind's parent company, is the second largest producer of wind power in the U.S. with more than 3,000 MWs. IBR invested $2.2 billion in wind power in the U.S. in 2008. IBR through its subsidiary Lempster Wind, LLC owns and operates a 24 MW wind power project located in Lempster, NH. This project is the only significant wind power project operating currently in New Hampshire.

Groton Wind, LLC contracted with Professor Ross Gittell from the University of New Hampshire's Whittemore School of Business and Economics to independently examine the potential impact of the Project on the local area economy in northern and central New Hampshire. The Project will be considered before the New Hampshire Site Evaluation Committee. This study is intended to help inform the members of the Committee as to the expected local area economic impacts of the project. In conducting this economic analysis, emphasis was placed on providing conservative estimates of the economic impacts of the Project.

To evaluate the local area economic impacts of the Project, the research team[2] drew on their previous research performed that focused on the economic impacts of wind power in New Hampshire including: 1) the New Hampshire Renewable Portfolio Standard legislation, 2) New Hampshire's participation in the Regional Greenhouse Gas Initiative (RGGI), 3) green industry employment in New Hampshire, and 4) the local economic impact of the proposed Granite Reliable Power wind project in Coos County. The research team also considered current studies related to the economic costs and benefits of wind power project developments.

The research team considered the direct, indirect and induced economic impacts of the Project on Grafton County and the surrounding local area (Belknap, Carroll, Coos, Merrimack, and Sullivan counties) economies. This analysis included evaluation of the local area economic impacts during the construction phase and the on-going operations phase. Economic factors considered included employment, local capital expenditures, tax revenue, local material and supplies purchases, landowner payments and the broader "multiplier" impacts of the Project.

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[1] Spreadsheet containing expected capital expenditures for the Groton Power Project. Actual project cost will vary depend on market prices of wind turbines, labor and construction materials.

[2] The research team consisted of Ross Gittell and Matt Magnusson. A summary of their experience is provided at the end of the report.

## 2.2 Wind Energy and the Economy

### 2.2.1 U.S. & New England Wind Energy Industry

The U.S. wind energy supply expanded robustly by 50% in 2008 with the installation of 8,300 MWs of new generating capacity—capable of powering over 2 million homes annually. The construction activity brought in over $17 billion in new investment into the U.S. economy.[3]

New England has 141.5 MWs of wind energy facilities installed, far below the leading state Texas at 8,800 MW. The region's wind power capacity also pales when compared to next door neighbor New York with 1,274 MWs of wind energy.[4]

However, New Hampshire and Maine are beginning to stand out in the region with their significant growth in wind development. New Hampshire installed 24 MWs of wind power in 2008 and has 99 MWs of wind power in Coos County permitted for development. Maine has 104 MWs of wind power installed—with 95 MWs installed since 2007—and 157.5 MWs of additional wind power under development.

**Table 4: Top Five U.S. States 2009 by Installed Wind Power Capacity**

| State | Installed Wind Capacity (MWs) | Under Construction (MWs) |
|---|---|---|
| Texas | 8,797 | 660 |
| Iowa | 3,053 | 399 |
| California | 2,787 | 20 |
| Minnesota | 1,805 | 60 |
| Oregon | 1,659 | 337 |

Source: American Wind Energy Association, December 2009

[3] "Wind Energy Grows by Record 8,300 MW in 2008," Press Release, American Wind Energy Association, Jan. 27, 2009, Available online at http://www.awea.org/newsroom/releases/wind_energy_growth2008_27Jan09.html

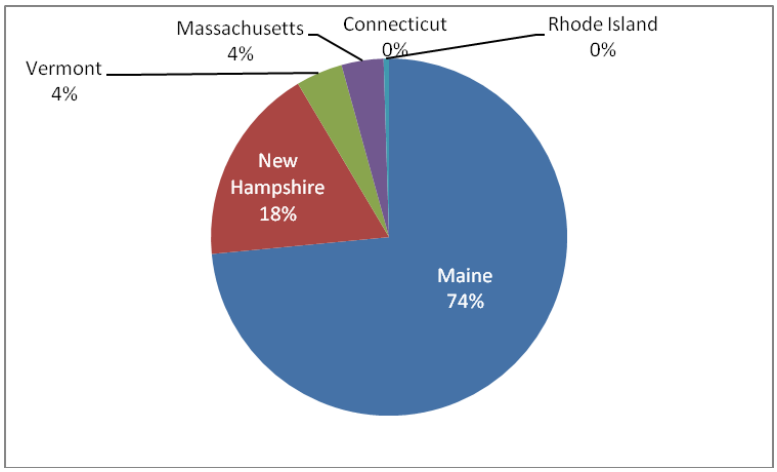
[4] "AWEA – Projects," Web Page, American Wind Energy Association, Available online at http://www.awea.org/projects/

**Table 5: New England Wind Power Statistics**

| State | Installed Wind Capacity (MWs) | Under Construction (MWs) |
|---|---|---|
| Connecticut | 0 | 0 |
| Maine | 104 | 157.5 |
| Massachusetts | 5.4 | 3.6 |
| New Hampshire | 25.4 | 0 |
| Rhode Island | 0.7 | 0 |
| Vermont | 6 | 0 |

Source: American Wind Energy Association, December 2009

**Figure 1: New England Installed Wind Power Capacity in 2009**




Source: American Wind Energy Association, December 2009

The relatively modest amount of wind power development to-date in New England is not due to a lack of adequate wind resources. In New Hampshire, estimates of economically developable wind range from 500 – 2,200 MWs.[5] The potential is well above the current operating capacity of 25 MWs. The low level of wind development is unexpected given that New Hampshire and every other New England state has passed some form of Renewable Portfolio Standard (RPS). RPS legislation requires utilities to purchase a specific percentage of power from renewable sources and is a public policy supportive of renewable energy—including wind power—development.

There are several reasons that help to explain the low level of wind power development in New England when compared to the significantly higher level of activity seen in other

[5] 500 MWs is the potential capacity provided by the American Wind Energy Association (AWEA) and 2,200 MWs is based on an economic study performed by the University of New Hampshire (UNH) assessing the economic potential of a Renewable Portfolio Standard in 2007. The AWEA estimate is available at http://www.awea.org/projects/Projects.aspx?s=New+Hampshire and the UNH study is available at http://www.renewableenergyworld.com/assets/documents/2007/unh_rps_report_final.pdf

areas of the country. One factor is the relatively high density of the New England population. The high density can make it harder to site projects, specifically due to potential opposition sentiment by vocal organizations.[6] Another factor is that wind resources are not uniformly distributed in New England and the most favorable sites—in terms of wind power generation potential—tend to be located along mountain ridges that presently have more costly construction costs.[7]

These factors drive up costs and has steered development to other areas of the country with lower development costs. New England costs are typically at least 25% higher than those seen in similar installations in other regions of the country. As a region, New England has the highest expected costs for on-shore wind installations in the U.S.[8]

Even though wind development can be more challenging in New England than in other areas of the country, there is considerable opportunity for New Hampshire and New England to develop significant new sources of wind power capacity. In fact, New England is starting to experience significant growth in wind power development; the majority of capacity has come on-line since 2007.

These new wind projects in New England are being built due to a combination of factors including: advances in turbine technology, relatively high regional wholesale electricity prices; federal policies (primarily the production tax credit); wide public acceptance of the need to address climate change and the use of fossil fuels; and increased state incentives (predominantly Renewable Portfolio Standard legislation).

### 2.2.2 Wind Power Economic Impacts

Wind power development offers significant economic benefits from the associated manufacturing, permitting, construction, and on-going operation activities. The economic benefits of wind for communities include the creation of local jobs, increased tax revenues, and generation of lease income for land owners.

A broader economic benefit is diversification of the power generation mix—wind power acts as a hedge against fossil fuel price volatility—which helps to provide households and businesses with more stable and potentially lower energy prices.[9] Because wind power

[6] "The Offshore Wind Power Debate: Views from Cape Cod," Coastal Management, 2005, Available online at http://www.ceoe.udel.edu/Windpower/docs/KempEtAl-OffshoreWindDebate05.pdf

[7] "New England Wind Resources," New England Wind Forum, U.S. Department of Energy, Available online at http://www.windpoweringamerica.gov/ne_building_resource.asp

[8] "20 Percent Wind Energy Penetration in the United States: A Technical Analysis of the Energy Resource," Black & Veatch, October 2007

[9] "Renewable Energy as a Hedge Against Fuel Price Fluctuation: How to Capture the Benefits," Commission for Environmental Cooperation, May 2008, Available online at http://www.cec.org/files/PDF/ECONOMY/QA06.11-RE%20Hedge_en.pdf

does not emit air pollution when generating electricity, it can help reduce the total air pollution emitted by regional power generation, including greenhouse gas emissions which are associated with climate change.

The benefits provided by individual wind power projects from energy diversification and the reduction of pollution are very difficult to quantify for individual states or local areas. Energy market and pollution reduction economic impacts are most relevant when individual projects are aggregated and considered on a larger scale. As part of this report's conservative approach and local economic impact focus, an assessment of the energy diversification and emission reductions benefits of the Project are not included.

This report also does not include the potential eco-tourism benefits— increased tourism and visits to the area to see the wind farm— from the Project. There can be benefits from eco-tourism, but they are very difficult to measure and forecast, as the public interest in projects varies greatly.

In this analysis, the impact of the Project on the local area economy is broken down into three distinct aspects.

1. **Direct Impacts -** Direct impacts are the employment and local capital expenditures necessary to manufacture and install the wind turbines and associated infrastructure of a wind power project. Direct construction activities include: land clearing, excavation, concrete and steel work, trucking, crane operation, engineering, and other professional services. There are significant direct economic impacts from the manufacturing of wind turbines and their associated components. However, the manufacturing facilities are often not located in the same locations as the wind power projects. This is the case with the Project as the turbines are expected to be manufactured in Pennsylvania.[10]

2. **Indirect Impacts -** Indirect impacts are the increased employment and economic activity brought on by the expenditures of firms during the wind power project that are directly involved in construction and manufacturing. For example, the construction of turbine foundations, increases demand for gravel, sand, and cement, which in turn increases economic activity at quarries and cement factories. Indirect activity also includes local purchases of equipment, supplies, lodging of workers, parts and professional services[11].

3. **Induced Impacts -** Induced impacts are the increased employment and economic activity brought on through the expenditure of income and earnings in the broader local economy by individuals directly and indirectly employed by the project and increased expenditures by members of the local community as a result of the project. This can include expenditures in the local retail sector on goods and services including: food, clothes, utilities, transportation, recreation, medical care, and childcare.

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[10] Iberdrola Renewables, November 2009.

[11] For example, Lempster Wind, LLC reported that meals and lodging were a significant source of economic activity for Lempster, NH during the construction phase. In this context, lodging for workers would be considered an indirect impact and meals bought locally by workers would be considered an induced impact.

# 3 Methodology & Assumptions

In this economic analysis, the following analytical tools were used: 1) the Job & Economic Development Impact (JEDI) Wind Energy model, 2) IMPLAN, and 3) spreadsheet modeling. The JEDI Wind Energy model (Wind Model rel. W1.09.03e ) is provided by the National Renewable Energy Laboratory (NREL) and is a widely used and cited economic input-output model that is used to calculate regional economic impacts from wind power generation projects. IMPLAN 2.0 (2007 data) is a system of software and databases produced by the Minnesota IMPLAN Group (MIG) that is also widely used and accepted for regional input-output economic modeling; this model serves as a source of local economy employment and output multiplier inputs for the JEDI model. Additional spreadsheet modeling relied on project specific data, information gained from interviews with project managers and 2008 employment data available through the U.S. Bureau of Labor Statistics to supplement and expand on the model outputs from the JEDI and IMPLAN models.

The project was evaluated in two phases: construction and on-going operations (post-construction). In determining the job impacts of the Project, the research team defined the "local area" economy to include Grafton County and bordering Belknap, Carroll, Coos, Merrimack, and Sullivan counties. In this analysis, the research team drew extensively on the experience they gained from modeling the Granite Reliable Power wind project in Coos County. Data was also obtained from IBR for the Lempster wind power project—including project cost data and employment data—which helped guide the analysis.

The NREL JEDI Wind Energy model was used to calculate the direct, indirect and induced jobs associated with the construction phase of the project. The JEDI Wind Energy model calculates direct jobs as the sum of jobs associated with foundation preparation, turbine erection, electrical installation, management/supervision services, engineering professional services, and distribution line installation.

The JEDI model calculates direct jobs by dividing the total labor wages for any given job category (such as foundation) by a FTE Average Annual Wage (AAW) factor. This FTE AAW factor is FTE hours worked (2,080 hours) times the hourly labor wage for a job category increased by a payroll expense factor (government share & benefits). The JEDI default for payroll expense is 37.6%; this analysis assumed the same payroll expense. Total direct job creation from the JEDI model (with some slight exceptions) is a direct function of the total wages and the hourly wage assumed for different categories of employment.

**Equation 1: JEDI Model Direct Jobs Calculation**

$$Direct\ Jobs_{Jedi\ Model} = \frac{Total\ Wages}{2{,}080\ hours\ x\ Hourly\ Wage\ x\ (1 + \%\ Payroll\ Expense)}$$

The draft capital expenditure (CAPEX) budget for the Project provided by Groton Wind LLC did not provide line item estimates of labor for the project. This is because work is awarded to contractors in a quote process where they do not separate out labor, materials, and markup. In this analysis, a percentage of overall capital expenditures was allocated to labor based on discussions with project management at Groton Wind and default inputs from the JEDI Wind Energy model. None of the capital expenditures was allocated to local area labor for turbine component manufacturing. It was assumed that none of the major wind turbine components for the Project will be manufactured locally.

An overall hourly rate—based on the AAW of local area firms derived from the 2008 Bureau of Labor Statistics Quarterly Census of Employment and Wages—of $22.21 per hour was assumed. The JEDI model adjusts employment to account for jobs originating from the region of analysis. For the major JEDI job categories, the percentage of labor coming from local sources was based on discussions with project management from Iberdrola and JEDI model default inputs. The following table documents the percentage of local area labor assumed for each major JEDI job category.

**Table 6: Percentage of Local Labor Assumed for Each JEDI Job Category**

| JEDI Model Job Category | % from Local Labor |
|---|---|
| Foundation | 60% |
| Erection | 30% |
| Electrical | 85% |
| Management/Supervision | 20% |

The direct job calculations from the JEDI model for the Groton wind project were compared on a per MW basis with other sources. Literature research review revealed a national average range of between 40 and 160 FTE direct construction jobs per 100 MW of wind construction or a range of 0.4 to 1.6 FTE jobs per MW installed.[12] However, the labor experience in New England is different from the overall country because the locations typically selected for wind tower projects tend to require more labor during construction. This includes requiring additional personnel and equipment to construct roads, cut through rock and work in steep terrain.

[12] Pedden, M., "Analysis: Economic Impacts of Wind Applications in Rural Communities," National Renewable Energy Laboratory, January 2006, Available online at http://www.nrel.gov/docs/fy06osti/39099.pdf

A more appropriate FTE for direct construction jobs in New England is expected to be in the range of 2.0 to 2.5 jobs per MW installed.[13] The 135 FTE direct construction jobs estimated for the Project approximate this range at 2.7 FTE construction jobs per MW installed.

The IMPLAN model considers 440 industry sectors in its economic analysis engine. The JEDI model aggregates the 440 industry sectors in IMPLAN down to 14 industry sectors. The JEDI model allocates inputs for capital expenditures to employment and economic activity in the 14 different industry sectors. Using a similar approach to that taken for labor (drawing on the Project CAPEX and JEDI Wind Energy model default inputs), different portions of the Project CAPEX were mapped to specific JEDI construction phase inputs.

**Table 7: JEDI Model Aggregate IMPLAN Sectors**

| | |
|---|---|
| • Agriculture,<br>• Mining,<br>• Construction,<br>• Manufacturing,<br>• Fabricated Metals,<br>• Machinery,<br>• Electrical Equipment, | • Transportation Communication and Public Utilities (TCPU),<br>• Wholesale Trade,<br>• Retail Trade,<br>• Finance, Insurance and Real Estate (FIRE),<br>• Miscellaneous Services,<br>• Professional Services,<br>• Government |

Demand from material expenditures in these different sectors combined with economic activity from direct construction employment was used by the JEDI Wind Energy model to calculate indirect and induced economic activity associated with the construction phase of the project. In calculating these impacts, economic and employment multipliers were obtained from the IMPLAN model for the specific New Hampshire counties of interest; the default JEDI multipliers were not used. The direct, indirect, and induced economic and employment multipliers are specific to the region of New Hampshire under study.

Determination of indirect and induced economic impacts have a degree of uncertainty as the lead contractor, subcontractors and material suppliers have yet to be determined by Iberdrola. Therefore it is difficult to know the extent that materials will be obtained from local sources. In this analysis, conservative assumptions about the percentage of materials to be sourced locally were used.

[13] This range is based on three local projects. Unfortunately, there is not a great deal of documentation of labor or costs for New England wind power projects, both due to the limited number of projects to-date and project developer reluctance to share information about projects for confidentiality reasons. Iberdrola Renewables estimated approximately 60 FTE workers for 24 MW in Lempster, NH. The Granite Reliable Power Project economic impact study estimated 198 FTE construction jobs for 99 MW in Coos, County (available online at http://www.unh.edu/news/docs/windpowerreport.pdf). TransCanada estimated 300 jobs for the 132 MW Kibby wind power project (available online at http://www.transcanada.com/company/kibby.html ).

**Table 8 Percentage of Materials Assumed to be Sourced Locally**

| JEDI Model Material Category | % from Local Sources |
|---|---|
| Construction (concrete, rebar, equip, roads and site prep) | 40% |
| Transformer | 0% |
| Electrical (drop cable, wire, ) | 10% |

A different approach was taken in calculating the direct, indirect and induced economic impacts of the on-going operations phase of the Project. The JEDI model inputs did not match up well with data available from Groton Wind; the JEDI model required a higher level of cost classification than Groton Wind was able to provide at this phase of the project. The IMPLAN impact analysis module was used to calculate the employment and economic output impacts of direct employment wages, local company expenditures, tax payments—including Payment In Lieu of Taxes (PILOT) payments, New Hampshire Utility Property Tax and Business Enterprise Tax (BET)— and land lease payments.

For on-going operations, it was determined that there would be an estimated 6 permanent jobs, or 0.12 FTE jobs per MW, employed by Groton Wind. This is based on project data provided by Groton Wind. This is consistent with national average ranges of 6-10 permanent operations and maintenance jobs per 100 MW, or 0.06 – 0.1 FTE jobs per MW[14]. While the number of permanent positions is slightly above the range published in research, it is believed to be reasonable given the more labor intensive nature of New England wind power projects.

Groton Wind provided the research team with itemized estimates of labor and operation costs (including percentage expected to be spent locally), taxes, and land lease payments for the on-going operations phases. For comparison with another major wind project by another company in New Hampshire, the aggregated categories of expenses provided by Groton Wind were assessed relative to the aggregated expenses provided by Noble Environmental Power for the Granite Reliable Power Project in Coos County (a permitted 99 MW wind power project). The Project expenditures appeared to be of similar magnitude relative to the different project sizes. None of the Project costs appeared to be extraordinary or unusual. Confidentiality requirements for the Groton Wind project require that only aggregated economic impacts be presented and discussed in this report.

In the modeling analysis, it was assumed that all tax revenues were used to reduce the total tax burden and not to fund an expansion of government services. This was a conservative approach that results in the IMPLAN model outputting somewhat lower

[14] Flowers et al., "Wind Energy for Rural Economic Development," Power Point for Windpower 2005 Conference, National Renewable Energy Laboratory, May 18,2005, Available online at http://www.windpoweringamerica.gov/pdfs/wpa/flowers_windpower_2005.pdf

economic benefits and lower employment impacts than if all of the tax revenue was used to fund new services.

Separately the potential for Grafton County and the surrounding area to supply direct types of construction labor for the project was assessed. A list of industries directly involved in wind construction, based on the North American Industry Classification System (NAICS), was developed by the research team. This list of industries was used to determine local wages for the different types of direct construction employment expected to be seen in the project. Employment and wage data for 2008 was obtained from the U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages for the counties considered in this analysis.

**Table 9: NAICS Classifications for Direct Industries in Wind Power Construction**

| NAICS | Category Description |
|---|---|
| 23713 | Power and Communication Line and Related Structures Construction |
| 23731 | Highway, Street, and Bridge Construction |
| 23811 | Poured Concrete Foundation and Structure Contractors |
| 23812 | Structural Steel and Precast Concrete Contractors |
| 23821 | Electrical Contractors and Other Wiring Installation Contractors |
| 23891 | Site Preparation Contractors |

For each industry a location quotient (LQ) was calculated. The LQ is a ratio of employment for a specific industry in the local economy compared to the employment for that same industry in the broader U.S. economy. This ratio is calculated for industries of interest to determine whether or not the local economy has a greater share of that industry than expected based on employment. If an industry has a LQ greater than 1 then that is indicative of a region having strength in that particular industry. If an industry has a LQ equal to 1, then that is indicative of a region being average in that particular industry. If an industry has a LQ less than 1, then that is indicative of a region being weak in that particular industry.

# 4 Analysis

## 4.1 Local Area Economic Impact

Groton Wind's development activities have already begun to bring investment and dollars into the local economy. Groton Wind has spent over $1.2 million to-date on development activities with over 60% being spent in New Hampshire on services such as civil engineering, surveying, legal, project impact analysis, and permitting.

The construction phase is the period for which there will be the greatest economic activity and benefits for northern and central New Hampshire. The project is expected to contribute $24.5 million to the local New Hampshire economy during the construction phase. This would represent approximately 0.7% of total local area economic activity.

The construction activity would help stimulate the local economy during a period of stagnant employment due to a weak overall U.S. economy. New Hampshire's unemployment rate was 6.7% in November 2009, up significantly from the unemployment rate in November 2008 of 4.1%.[15] During the construction phase, the impact on local area employment would be significant with 229 jobs and $10 million in wages and earnings. Longer term, the local employment impacts are lower, but still significant for Grafton County and the surrounding local area.

**Table 10: Local Area Economic Activity during the Construction Phase of Groton Wind**

| | Jobs | Earnings (Millions) | Economic Output (Millions) |
|---|---|---|---|
| Direct Construction | 72 | $4.8 | $5.2 |
| Indirect | 107 | $3.5 | $14.1 |
| Induced | 50 | $1.8 | $5.2 |
| **Total Impacts** | **229** | **$10.1** | **$24.5** |

During the construction phase, 72 of the construction jobs created are expected to be local. The types of jobs created by this project are consistent with what are being termed "Green Jobs". Green jobs are jobs that involve, develop, or employ environmentally friendly practices or technologies; this includes the renewable energy sector. A recent report by the authors of this report on the green economy identified that green jobs can pay as high as 40% better than the national average[16]. This appears to be the case for the Groton wind power project as well with the construction jobs being well paying; the

[15] "Unemployment News Release," New Hampshire Economic and Labor Market Information Bureau, December 14, 2009, Available online at http://www.nh.gov/nhes/elmi/unempnr.htm

[16] Gittell et al., "New Hampshire's Green Economy and Industries: Current Employment and Future Opportunities," Whittemore School of Business & Economics, University of New Hampshire, January 2009

expected average annual wage is $46,200, 23% higher than the local area average of $37,700.

In addition, to the direct employment benefits, there are indirect and induced local jobs created as a result of the Project during the construction phase. These jobs significantly magnify the employment impact of the project on the local area economy. There would be expected to be 157 indirect and induced jobs created during the construction phase in the local area economy.

In the on-going operating phase (post construction), the economic and jobs impact of the wind power project are reduced but still significant. The project is expected to contribute $2.9 million annually to Grafton County and the surrounding local area economy. The project is expected to create an estimated 6 new jobs for employees of Groton Wind and 14 indirect and induced jobs in the surrounding local area. This would bring an additional $1.2 million in wages and benefits into the local economy.

**Table 11: Operations Economic Activity (Annual Basis)**

| | Jobs | Earnings (Millions) | Economic Output (Millions) |
|---|---|---|---|
| Direct (Groton Wind) | 6 | $0.6 | $1.1 |
| Indirect | 5 | $0.2 | $1.3 |
| Induced | 9 | $0.4 | $0.5 |
| **Total Impacts** | **20** | **$1.2** | **$2.9** |

The IMPLAN model predicted a net employment gain of 9 indirect jobs and loss of 2 induced jobs (net gain of 7 total jobs) if the additional tax revenue to government was used to expand services rather than reduce the existing tax burden on consumers. Consistent with the conservative approach of this analysis, it was assumed that this additional tax revenue did not result in additional government hiring but was instead used to fund current levels of service. If local and state government does expand services due to the new tax revenue, total on-going employment could be expected to increase up to a total of 27 instead of 20.

Total benefits, including direct, indirect and induced, to the local economy from the Groton Wind, LLC Project are expected to be $79.6 million or $1.6 million per MW over a 20-year period. This is consistent with other reports that are finding local economic benefits can be up to $1.6 million per MW over 20 year period from wind power project projects[17].

[17] Loomis, David, "Economic Benefits and Costs of Wind Farms," Power Point for the East Central Illinois Economic Development District , Illinois State University, January 30, 2009,
Available online at http://www.econ.ilstu.edu/dloomis/236web/lectures/costbenefitwindfarms.pdf

## 4.2 Direct Wind Construction Employment Potential in Local Region

Grafton County and the surrounding counties were assessed to see if the local area has the types of industries and skilled labor force required to support the Groton wind power project. It appears that there is an adequate local labor force for general construction, electrical and site preparation. The region appears to be strong in site preparation and general construction based on location quotients (LQ).

Based on Bureau of Labor Statistic data, there does not appear to be a significant concentration of major concrete/structural steel firms present in the local area, which is a large and essential part of the turbine construction and erection process[18]. These findings support Groton Wind's assumptions on the amount of labor for the project to come from local sources. Groton Wind projected local employment for the Balance of Plant (BOP)—roads, foundations, operations and maintenance facilities—that 60% would be local. Turbine erection work was assumed to be only 30% local, and electrical work is expected to be approximately 85% New Hampshire labor.

**Table 12: Northern and Central NH Wind Construction Labor Force**

| Industry | Employees | Total Wages (Millions) | Average Annual Wage | Location Quotient |
|---|---|---|---|---|
| Total Employment | 154,815 | $6202.5 | $40,064 | |
| Power and Communication Line and Related Structures Construction | 101 | $6.4 | $63,043 | 0.51 |
| Highway, Street, and Bridge Construction | 537 | $31.6 | $58,820 | 1.21 |
| Poured Concrete Foundation and Structure Contractors | 255 | $10.7 | $41,796 | 0.87 |
| Structural Steel and Precast Concrete Contractors | 42 | $1.6 | $38,398 | 0.31 |
| Electrical Contractors and Other Wiring Installation Contractors | 749 | $33.7 | $45,046 | 0.61 |
| Site Preparation Contractors | 962 | $38.3 | $39,781 | 2.05 |

Source: 2008 Bureau of Labor Statistics Quarterly Census of Employment & Wages for Belknap, Carroll, Coos, Grafton, Merrimack, and Sullivan Counties.

[18] It is important to note that there are structural steel contractors in the region (i.e. Carroll Concrete in Newport, Isaacson Enterprises in Berlin, and the Canam structural steel facility in Claremont). The statistical data available through the Bureau of Labor Statistics does not appear to capture all of the structural steel contractors in the region. Therefore, there may be opportunity for a greater percentage of structural steel work to be performed by NH-based companies than the LQ analysis would indicate.

## 4.3 Fiscal Impact on the Town of Groton

Groton Wind has proposed an annual $400,000 Payment In Lieu of Taxes (PILOT) payment to the town of Groton, NH. The New Hampshire Department of Revenue Administration calculated the Town of Groton's total tax commitment for 2008 (covering municipal, county, and local and state school expenses) at $983,297. A $400,000 PILOT payment from the Project in 2008 would have either 1) provided additional funds of over 40% of existing tax revenues for town services, or 2) reduced the total local tax burden from $983,297 to $583,297. [19]

## 4.4 Economic Costs

Economic costs include potential property value effects and opportunity costs. While the impact of wind turbines on local residents can be a controversial topic, an objective way to assess the economic impacts of wind turbines on property values is to look for evidence that views of wind turbines, or proximity to wind turbines measurably affects real estate sales prices.

There have been numerous studies that have looked at this issue and studies have consistently not found any evidence that wind turbines negatively impact property values.[20] However, many of these studies had limitations such as relying on survey data of homeowners, basic statistical analysis, and small data sets.

In 2009, the Lawrence Berkley National Laboratory conducted the most significant analysis to-date using real estate market data. Their analysis looked at 10 wind power projects (including 4 located in the Northeast) and 7,500 real estate sales transactions both pre- and post- project construction to evaluate the impact of wind power projects on residential property values.

The study found that neither the view of wind power projects nor the distance of homes to those projects had a statistically significant effect on sales prices. The study also concluded that while individual homes may be impacted by turbines, the impacts are

[19] Moffett, Howard, "Effect of Proposed PILOT Payments on 2008 Groton Tax Rates," Orr & Reno, October 7,2009.

[20] Risch, Christine, "Review of Studies Evaluating the Impact of Wind Farms on Property Values," Power Point, Center for Business and Economic Research, Marshall University, October 19, 2005, Available online at http:// www.marshall.edu/cber/research/Risch-WindEnergyWorking%20Group.ppt

either too small or infrequent to result in widespread, statistically observable impacts on sales prices.[21]

In terms of opportunity cost, there is not expected to be any significant opportunity cost related to land use. Timber harvesting and other forestry activities can still occur on the land surrounding the turbines that is being leased.[22] Therefore there are not expected to be any economic costs related to either property value or opportunity cost in relation to the Project.

# 5 Conclusion

The 50 MW wind power project proposed in Groton, NH is expected to have a positive economic impact on Grafton County and the surrounding local area with the highest impact experienced during the 11 month construction phase. During the construction phase, economic activity associated with the wind power project will add $24.5 million to the local area economy (adding 0.7% to local area economic activity). Given the weak state of the current economy, this project – with its immediate and stimulative impacts – can be particularly valuable to the local area economy. Long term, on-going benefits will be from an estimated 6 on-site jobs, local purchases of goods and services by Groton Wind (such as plow contracts, maintenance contracts, supplies), land owner lease payments and tax/tax equivalent payments to local and state government resulting in an annual increase of $2.9 million in local area economic activity (or 0.01% of local area economic activity). An annual PILOT payment of $400,000 would have a significant impact on the revenue to the town of Groton in New Hampshire.

The construction jobs and direct employees of Groton Wind created by this wind power project will be part of the growing green economy in New Hampshire and are expected to be high quality, paying over 20% higher than the local average annual wage. The project is expected to create 229 jobs in the local economy paying $10 million in wages and benefits during construction and an estimated 6 permanent jobs for employees of Groton Wind and 14 jobs in the local area economy paying $1.2 million in wages upon project completion.

[21] Hoen et al., "The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis," Ernest Orlando Lawrence Berkley National Laboratory, December 2009.

[22] Groton Wind, LLC

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# 7 Research Team

*Ross Gittell* is the James R. Carter Professor at the University of New Hampshire's Whittemore School of Business and Economics. Professor Gittell's research has been funded by the National Science Foundation, the Rockefeller Foundation, and the Energy Foundation. Professor Gittell's applied research activities in the New England region include work for the states of New Hampshire and Massachusetts, the New Hampshire Business & Industry Association, the State of New Hampshire's, Department of Environmental Services, the New Hampshire Small Development Center, the Children's Alliance of New Hampshire and the Josiah Bartlett Center for Public Policy.

Professor Gittell is Vice President, forecast manager and on the board of the New England Economic Project. He is also on the board of the Exeter Trust Company, the Endowment for Health, and Exeter Health Services.

*Matt Magnusson* is a graduate of the University of New Hampshire's Whittemore School of Business and Economics with a Masters of Business Administration. He currently is earning his Ph.D. in Natural Resources and Environmental Studies at the University. He has worked with Professor Gittell to provide analysis on the economic impacts of several different public policy initiatives in the state of New Hampshire, including the Renewable Portfolio Standard (RPS) and the Regional Greenhouse Gas Initiative (RGGI) for the New Hampshire Department of Environment and Services (NH DES). Their analysis of these policies proposed by the NH DES has been influential in the passage of NH state laws implementing those policies.

Research performed in the last year includes "New Hampshire's Green Economy and Industries: Current Employment and Future Opportunities" performed for the Rockingham Economic Development Committee (REDC), "Economic Impact of Granite Reliable Power Wind Power Project in Coos County, New Hampshire" performed for Granite Reliable Power, LLC and the economic analysis of policies proposed in "The New Hampshire Climate Action Plan" performed for the NH Climate Change Task Force. Matt is a member of the United States Association for Energy Economics and presented a paper on RGGI at their 28th annual conference.

Sturgeons' General Store
Rt 10
Lempster, NH 03605

To whom it may concern:

We had just opened a general store in Lempster, NH last May. In a declining economy folks wondered how wise my decision was.

I'm writing this letter to tell you how huge a lift the windmill project gave the store.

Kevin Onnela informed the crew that Sturgeon's General Store was open and serving food. The crew began to trickle in, then things busted wide open. Everyone was eager to support the locals as they put it. They came to Sturgeon's General Store on a daily basis and when family came for a visit they brought them in for a meal. boost to our business spanning over seven months.

The windmill project continues to bring in revenue. The crew currently working there to maintain the windmills frequent our store daily.

I believe the windmills will continue to be a contributing factor to our success. Folks are continually coming to Lempster to view the windmills. They come to Sturgeon's asking directions or inquiring about the windmills. We are fortunate and thrilled to have the windmills in our community.

Sincerely,

Cathy Sturgeon

**Fulton's Construction, LLC**
763 US Route 10, P. O. Box 369, Lempster, NH 03605
Telephone: (603) 863-1579

March 18, 2009

To Whom It May Concern:

We would like to express our sincere satisfaction with the Wind Farm which is now up and operating in our town of Lempster, NH, the first in the state, to utilize Green Power.

We, as both residents and business owners can attest to the benefits generated by this project. From our front porch we enjoy a birds-eye view of at least 6 spinning units and were privileged to be a part of the construction process, as a supplier of fine quality materials.

Local businesses have benefited as well from the great influx of visitors from near and far to witness this fascinating display. The apprehension voiced by a few regarding the possible distortion of the ridgeline, noise, effect on bird migration and other aspects have been greatly dispelled. There will always be some who will find fault, but the majority of the town folks are very pleased with the end results.

Keith R. & Jason M. Fulton

# Newport Motel

**Routes 11 And 103**
**467 Sunapee Street**
**Newport, N.H. 03773**

March 17, 2009

To Whom It May Concern:

Our names are Bob and Rita Wagner and we own the Newport Motel in Newport, NH. We would like to let you know that when they first started the Lempster Wind Farm, many companies, contractors and equipment were scheduled. From day one, we had people from all aspects of the job staying at our motel; from excavator, logistics, crane operators, electricians, escort vehicles and delivery vehicles to mention a few. They in turn would go to the local stores, restaurants, launder-mats and various other vendors in town. The project started in January 2008 and as each phase of the project finished up and the next phase began, and we would get the workers for that phase. To this day, we still have people associated with the project stopping by from time to time. We have benefited greatly from this project, giving us the best year since we bought the motel in 2003.
We believe the wind farm project was a great success for the economy in this area.

Sincerely,

Rita Wagner

Bob and Rita Wagner
Newport Motel
603-863-1440

Village Forge

Welding & Fabricating
104 Post Office Road, Newport, NH 03773
Telephone: (603) 381-8853

To Whom It May Concern:

I am writing this letter as owner and operator of Village Forge Welding. The windmill project in Lempster NH provided my company with weeks of employment from several contractors that worked on, or were associated with the project.

Aside from the much-needed work, the project is supplying clean power to many homes with very little impact to the area. As a matter of fact, the project can be seen from my home and stood out for a week or two. After that time the project blends into the hills and one has to stop and look to notice it.

Another point worth mention is the care that the contractors took in respecting the town's wishes and demands. They did their best to make every person, committee and community member as content as possible. The area was clean and safe which creates a great environment to work in.

If any one has negative concerns about a wind project, please take a drive to Lempster NH and spend some time, you will see a completed project that not only looks good but produces much needed energy from here at home.

Please feel free to contact me with any questions or concerns.

Paul Manson
Village Forge Welding
104 Post Office Rd
Newport NH 03773
603 381 8853

# Weathercheck, LLC

March 21, 2009

To- Lempster Wind Farm
C/O- Kevin Onnela
Route 10 North
Lempster, NH

Mr. Onnela,

I would like to thank you for the opportunities provided by the construction of the Lempster Wind Farm.

Aside from the many obvious benefits of using alternative/wind energy, I have seen many local economic benefits as well.

I own the roofing company that was employed to install the roofing on the maintenance building. In these tough economic times, the work was truly appreciated. Our company employees around a dozen people (families) in the immediate area. It is projects like this one that keep our firm and its employees going.

On top of that, we put approximately one million per year back into the local business stream. It is important to us to keep the local market stimulated. Local business supports local business! As a business owner, I know many other local owners.

We have all noticed a large influx of funds generated by your specialty personnel. These are the people employed to actually build the wind mills. There is of course is a small field of people available to perform this. With that knowledge, they had to be contracted elsewhere. Perfectly understandable.

I have personally met many of these men. I have found them all to be polite, hard working, men of integrity. Most of whom are small town people just like us.

These workers are constantly fueling the local food service, construction supply, and lodging industry. All of which is greatly needed in today's economic struggle.

Thank You Again,

Michael A Mayo/President
Weathercheck, LLC

Post Office Box 255, Georges Mills, New Hampshire 03751
(603) 763-4900 / Fax (603) 763-2837
4 Generations of quality service
weathercheckroof@hotmail.com

COUNTRY KITCHEN
RESTAURANT
PO BOX 308
NEWPORT, NH 03773
603 863-7881

To whom it may concern:
Re: Lempster Wind Farm

A little background info:
My wife; Lisa and I own and operate a small family restaurant in Newport some 12 miles from Lempster. We might seem a little biased, but for us windmills are a "No Brainer". With the current energy market the way it is why not opt for an alternative energy source with little or not impact on the surrounding communities.

We had the opportunity to have direct contact with Management and employees who were involved in the construction of the towers. They stayed in our local motels and ate at our local restaurants (our included), just a nice bunch of guys who provided a nice boost to our local economy. And with the current state of the economy every little bit helps.

To the people who oppose windmill farms I can only say look at the overall picture. The local economy boost plus the long term benefits of wind energy far exceed any other concerns.
Three cheers for the windmills,
Pat & Lisa Tremblay

Pat & Lisa

**Homes by Holmes**
*New Homes---Additions---Garages---Decks*
*Donald K. Holmes*
*PO Box 539*
*Grantham, NH 03753*
*603-865-9876*

To whom it may concern,

Homes by Holmes is a small construction company, building mainly residential and light commercia buildings. The opportunity to be involved in a "Green Energy" project was very exciting. The permitting and approval process was time consuming and at times frustrating. But the rewards and sense o accomplishment far outweighed the lengthy process.

We built a 2,400 sq. ft. Operations and Maintenance building for the Lempster Wind Farm. During the construction of this building we employed 30 local people from different trades. We purchased $130,000 of building materials from local suppliers. Just this building sent **$300,000 into the local** economy.

The size of the building required to support the wind farm proposed in your area should be larger than the one in Lempster. So one can deduce that the sum of money going into your local economy would be larger than $300,000.

In addition to the construction projects themselves, benefits to the local stores, restaurants and other businesses would be realized as well. In our area the restaurants were visited daily by many workers from the wind farm, many of whom were renting apartments and hotel rooms. In this current economy the definite influx of revenue for these businesses would be welcomed.

Respectfully submitted,

Donald Holmes

Donald Holmes
Homes by Holmes

**Goodrich Oil Company Inc.**
5 Putnam Road
Newport, New Hampshire 03773
603-863-3700 fax 603-863-2971

Dear Mr. Onnela,

I would like to take this time to thank you for informing the out-of-state contractors that worked on your wind farm project in 2008, about the available businesses in the community. In my case, I'm a local fuel oil dealer. Your project provided me a lot of extra work throughout 2008, not only in the winter when we are busy, but during the slow months of summer, delivering to all the equipment. It was nice to be able to keep the oil drivers employed and busy. We probably wouldn't have known about the contractors that worked there if you hadn't put the wind mills up. We also received more work after your project was done from the same contractors and hope to continue those relationships. I know that after speaking with local businesses and restaurants that they also benefited from the extra business. Thank you again and we wish you much success.

Sincerely,

Christopher Marcotte
President, Goodrich Oil Company

In The 20 years I have owned my store I have seen a lot of construction company's come into the area do a project and leave. Of all the company's I would have to say all the people that came to do the wind project were among the better ones.
From the time the project started in late December to some time in the fall there was a large increase in business. Starting early in the morning through lunch and well into the late day. Weather it be construction workers in the morning for coffee, donut's, drink's or whatever to most all of them and more to return for lunch and returning after work to get what they needed for the evening. It was easy to see that all company's involved were supporting all the local business that they could, from myself for gas, food, snack's and beverage to lumber yards, restaurant's, parts stores ect. All the people involved were a pleasure to have around for the summer and would be more than welcome back.
Thanks to all involved we had a very good year at the sore.

Steve LaBossiere
Goshen Country Store

Wind Farm Construction spent Significant Amounts
with us (A Local Building Material Supplier)
Their Business was a welcome Intrusion
in These Economic Times

Thanks
Kent Hall